EAI®

380

ANALOG/HYBRID COMPUTING SYSTEM

MAINTENANCE SERIES

CONSOLE COMPONENTS

EAI® 380

ANALOG/HYBRID COMPUTING SYSTEM

MAINTENANCE SERIES

CONSOLE COMPONENTS

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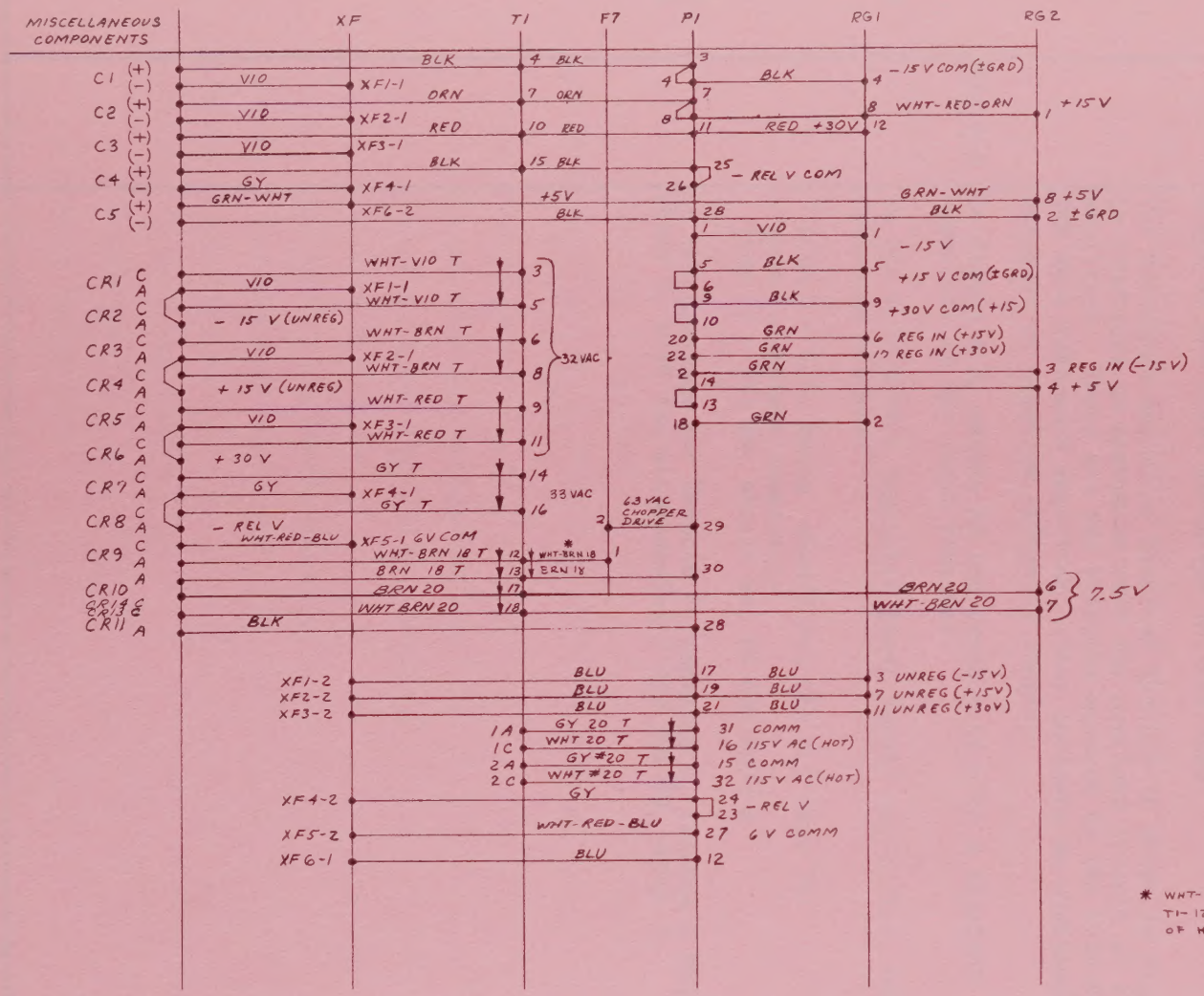

* WHT-BRN 18 WIRE FROM T1-12 TO F7-1 NOT PART OF HARNESS.

NOTES:
1. ALL WIRES ARE PHU 24, 600V
2. ALL BUSS SD ARE 20.
3. "T" IN WIRE COLOR DENOTES TWISTED PAIR.

00 010 0309 1W

NO.	REVISIONS	APP'D
1	AREA G-4. TERM-RG2-7 WIRE COLOR WAS SPEC'D AS "WHT 20" 1 MAY 63 RCERN TR98-09-1	

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MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN DF
RESISTANCE IS IN OHMS
TOLERANCE OF: X = ±.03 .XX = ±.02 .XXX = ±.015 XXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED
SCALE
DWG. NO. WAS:
USED ON:
DRAWN
CHKD
DSGN
DATE
RCDR
REVWD
APPVD

SHT. NO.
SIZE
REV. NO.
PROJECT 19163
C 010 309 0W
SHEET 4 OF SHEETS

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PAGE	ITEM / PARA	REVISION
6-3	Fig 6.3	In Figure 6.3, R1 and R2 are incorrectly identified. R1 is the 4.7K resistor terminated at OV4-X and R2 is the 2.2K resistor to ground.
6-4		Delete the first paragraph on page 6-4. Insert the following paragraph as the first paragraph on this page: The Reference Amplifier Overload Circuit is shown in Figure 6.5. It is identical in operation with the overload circuit of the operational amplifier. There are two circuits mounted on the 0.26.0294 card, one for each reference amplifier. They indicate an overload in the positive or negative reference supply.
6-5	Fig 6.5	In Figure 6.5, delete R2 and replace it with a straight line from the capacitor to the input terminal.
7-17		In the 0.10.0309-1 Regulated Power Supply parts list, make the following changes: item 5 - Ref. Desig. should be; CR5,6,9 thru 14. item 6 - Delete completely. item 12 - EAI No. should be; 00 684.0273-0
7-23/ 7-24		In the drawings for Chapter 7, Appendix 2, replace C 010 309 OW, sheet 2, with the accompanying C 010 309 OW, sheet 4.

DATE 6/17/69

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CHAPTER

1

CHAPTER 1

SYSTEM INTRODUCTION

1.1 GENERAL DESCRIPTION

The 380 Analog/Hybrid Computing System (Figure 1.1) is a desk top, general purpose, 10 volt computer. This analog/hybrid computer features selection of a wide variety of analog and synchronous logic components to provide many classes of problem solving capabilities. The basic system is pre-wired to permit plug-in expansion to a full equipment complement. This feature permits the user to select those components necessary for the immediate needs at hand, and, as desired, to expand the system to meet future requirements.

1.1.1 General Layout

The computer console is organized to optimize both electrical operation and operator convenience. Figures 1.2 and 1.3 show the location of the major components at the front of the computer.

In general, active computing components are housed in trays that plug into connectors at the rear of the patch bay area. These trays are self-shielding, with critical components directly connected to gold-plated patching contacts to minimize lead length. The removable patch panel (covering the patch bay area), can be pre-programmed remotely from the computer. The use of multiple pre-programmed patch panels permits different groups to share the computer with a minimum amount of wasted computer time.

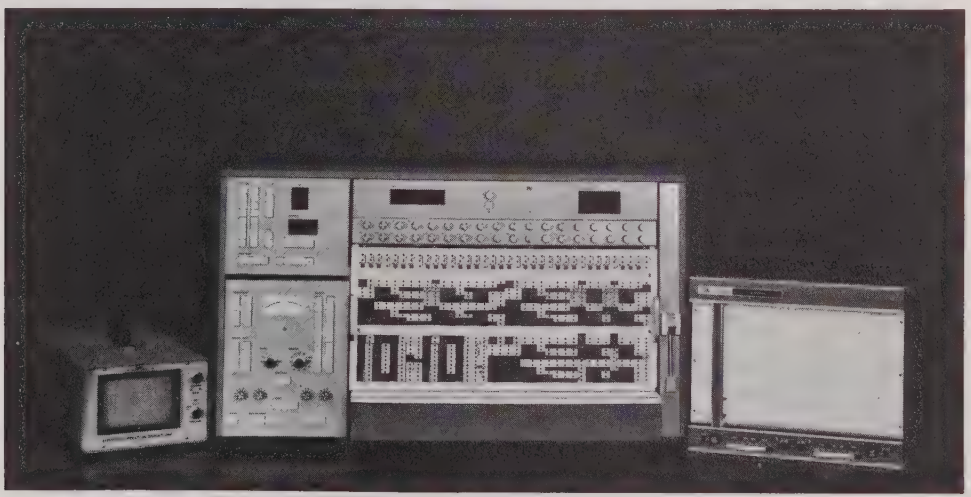


Figure 1.1. The 380 Analog/Hybrid Computing System

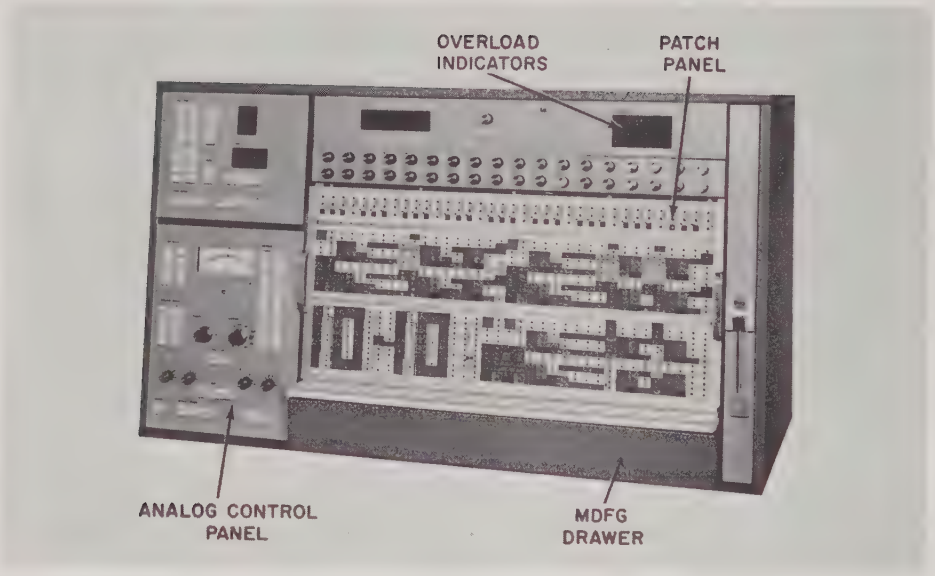


Figure 1.2. 380 Computer Console Layout (Front View)

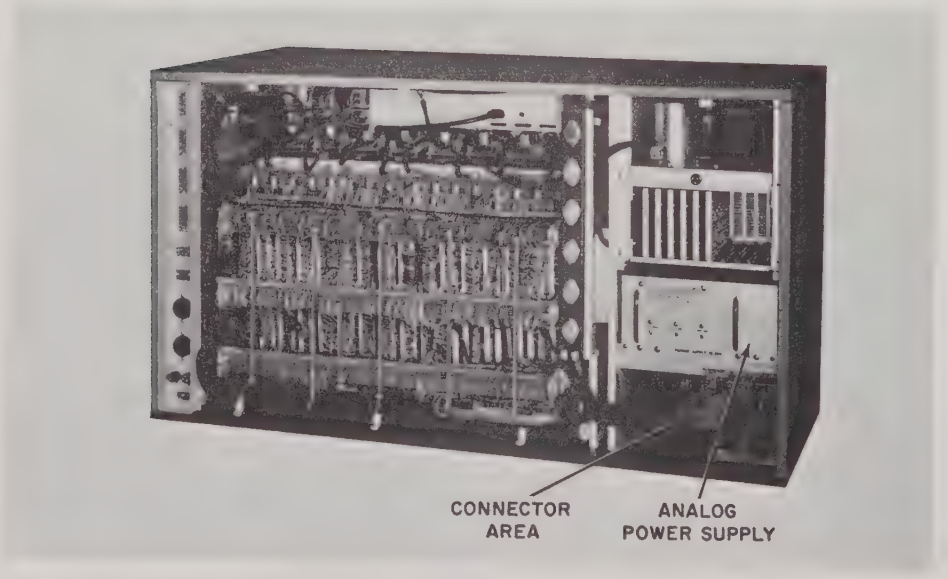


Figure 1.3. 380 Computer Console Layout (Rear View)

Controls for variable diode function generators are housed in slide-out drawers mounted beneath the patching area. All controls within the drawers are clearly identified and positioned to assure ease of operation.

The power supply is mounted behind the control panel area and is accessible from the rear of the computer. Level-setting potentiometers and fuse receptacles are located on the front panel of the power supply and are also accessible from the rear of the computer. A terminal board (TB1) is mounted behind the analog control panel with jumpers arranged for 105-125 volts or 210-250 volts. The regulated output voltages are wired from the series regulators, on the heat sink, to the bus bars at the rear of the patch bay.

The main operating control pushbuttons are keyboard mounted on the analog control panel. The pushbuttons are arranged in logical groups for convenience, and are the only controls necessary for normal operation during problem setup or computer operation.

The digital voltmeter (DVM) is mounted in the area above the pot panel. A null potentiometer mounts in this area when a DVM is not included in the console.

1.1.2 Patch Bay Organization

The layout of the patch bay provides maximum convenience and requires a minimum amount of programming time (Figure 1.4). A description of the electronic location (address) and physical location (position) is given below.

The patch panel is numbered for addressing purposes. As an example, general purpose summers and inverters are designated A00 through A29, the MDFG's are designated F30 through F33, and the potentiometers are designated P00 through P35.

For physical location purposes, each tray position is numbered in ascending numerical order from left to right. The top row of trays are numbered 0 through 17. The positions in the second row are numbered 18 through 35. Numerical identification of tray position is used to allow easy correlation with the rack wiring. (See Appendix 2 of this chapter.) For example, tray position 0 coincides with connector A0 on the wiring sheets. When two connectors are used in a single tray position, one connector is labeled A and the other connector is labeled B. Both connectors have the same position number (i.e., A31 and B31).

Detailed descriptions of all plug-in computing trays are provided in the Computing Components Manual of the 380 Computing System (EAI Publication Number 00 800.2066-0).

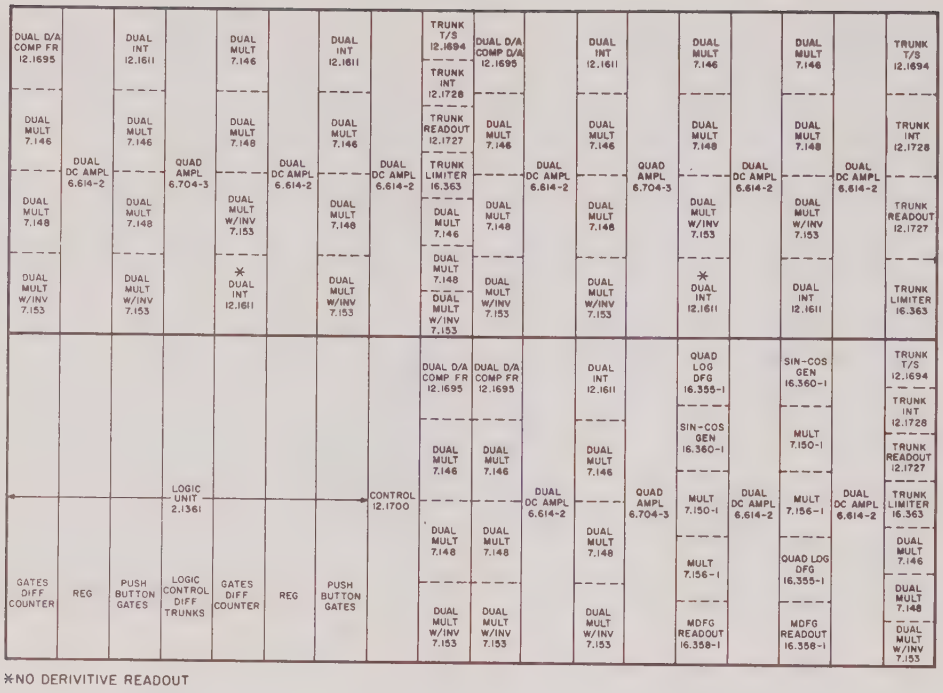


Figure 1.4. Basic Patch Panel Layout

1.2 SCOPE OF MANUAL AND STANDARDS

This manual, and the other manuals in the 380 Analog/Hybrid Computing System Maintenance Series, are intended to provide sufficient information to permit reasonably skilled personnel to maintain the computer at specified accuracy. Basic theoretical information is omitted, as are detailed patching instructions and application information. The 380 Reference Handbook (EAI Publication Number 00 800.2064-0) provides complete patching and operating information for the computer. A Handbook of Analog Computation (EAI Publication Number 00 800.0001-3), supplied with all 380 Computers, provides basic programming and scaling information.

1.2.1 Standards, Definitions, and Conventions

The 380 Maintenance Series manuals conform with commercial standards in format and content. In addition, military standards and abbreviations and schematic and logic symbols (MIL-STD-12B, MIL-STD-15-1A, and MIL-STD-806B, respectively) are used whenever applicable. However, many specialized terms and phrases are frequently abbreviated in the text of these manuals; these abbreviations are defined in Paragraph 1.2.1.1. In addition, several terms have special or restricted meanings when used in the 380 Maintenance Series manuals; these terms are defined in Paragraph 1.2.1.2.

1.2.1.1 *Abbreviations and Symbols.* The abbreviations and contractions used in the 380 Scientific Computing System Maintenance manuals generally comply with MIL-STD-12B. Due to space limitations on the patch panel, and the use of many special terms, some deviations are necessary. The following is a list of abbreviations used with the 380 Scientific Computing System.

Abbreviations	Definitions
A (Timer)	Output for IC bus drive
$\overline{A}$ (Timer)	Output for operate bus drive
AJ	Amplifier junction
A SEL	Amplifier select line
C	Integrator capacitor termination
CHT ON (Plot)	Input for recorder chart drive
COMP	Input control for analog-to-digital comparator
CONSL	Console
COS	Cosine
D/A SW	Digital-to-Analog Switch
DFG	Diode function generator
DN (Plot)	Input for plotter pen control
DVM	Input to digital voltmeter
F	Feedback for shaping network
FAST	Selects 10 times smaller capacitor when word exposed
FB	Feedback
FET	Field effect transistor
FF	Flip-Flop
FJ	Function junction
F (X)	Function of (X), MDFG output
GRD	Ground
H	Hold
HI	High end of potentiometer
HQ GRD	High quality ground
IC (Control)	Override for IC bus
IC	Input for initial condition
	Integrator IC mode control
IJ	Initial condition junction
IND	Indicator
INV	Inverter
I/O	Input/Output

Abbreviations	Definitions
J	Junction for shaping network
L	Latch
LM	Limiter junction
LO	Low end of ungrounded pot
MAN	Manual
MDFG (VDFG)	Manual diode function generator (Variable diode function generator)
MJ	Multiplier junction
MULT	Multiplier
O	Output
OJ	Operate junction
OLS (Channel)	Input for overload store
OP (Channel)	Overrride for operate bus
OPI	Integrator operate mode control
OVH (Channel)	Input for overrride hold (integrator only)
OVL (Channel)	Overload output
P	Wiper of pot
PC	Pot coefficient
POT	Potentiometer
PP (Channel)	Output from patch panel mode
R	Input to reset function relay
R	Passive precision resistor (10 = 10K; 100 = 1K)
REF	Reference
REL	Relay
RJ	Resistor junction
RO	Repetitive operation
ROP	Input to control REP-OP timer
S	Set function relay
SCOPE	Monitoring oscilloscope
SIN	Sine
SQ	Square
SJ, SJ	Summing junction
SL	Slave
SQR	Square root
SW	Input for digitally controlled analog switch

Abbreviations	Definitions
SWJ	Digitally controlled analog switch junction
T	Track input
TB (Control)	Output of sweep sawtooth
TF	Track feedback
TJ	Track junction
TS	Time scale, selects 500 to 1 capacitor
T/S	Track/Store
VM (Control)	Voltmeter input
X (Plot)	Input to plotter arm
X (Scope)	Horizontal input for display scope
XJ	Multiplier X junction
Y (Plot)	Input to plotter pen
Y_1 (Scope)	Input to Channel 1 of display scope
Y_2 (Scope)	Input to Channel 2 of display scope
Y_3 (Scope)	Input to Channel 3 of display scope
Y_4 (Scope)	Input to Channel 4 of display scope
YJ	Multiplier Y junction
Z	Override for display scope blanking
+	Plus reference
-	Minus reference
+ in	Input to plus log
- in	Input to minus log
+L	Input for plus limit
-L	Input for minus limit
+X	X input to multiplier
-X	Inverted X input to multiplier
+Y	Y input to multiplier
-Y	Inverted Y input to multiplier
1A	Termination to aid multiplier patching
1B	Termination to aid multiplier patching
1C	Termination to aid multiplier patching
1D	Termination to aid multiplier patching
2A	Termination to aid multiplier patching
2B	Termination to aid multiplier patching
2C	Termination to aid multiplier patching
2D	Termination to aid multiplier patching
ΣF	Summer feedback

Abbreviations	Definitions
∫	Integral
∫F	Integrator feedback
∫J	Integrator junction
θ	Phase angle (Theta)
	Digital inverter
	Digitally controlled analog switch
S R	Function relay in set position
	Passive diode

1.2.1.2 *Glossary of Terms.* This paragraph provides a list of computer and integrated circuit terms used in the 380 Scientific Computing System Maintenance Series manuals. Many terms not unique to the 380 System are specifically defined as used in this manual.

Address	The location of a computing component; code designating the exact storage location of an operand.
Amplifier Junction	The input terminal of an operational amplifier.
Digitize	Converting an analog measurement of a physical variable into a numerical value.
Digital Voltmeter	A voltage measuring device that provides a numeric indication of the value of an analog input.
Attenuator	A device used to reduce the level of a signal. This term is used interchangeably with potentiometer in this manual.
Buffer	An isolation or driver circuit common to digital logic. Also used as temporary storage units in the computer. Normally a buffer is an emitter-follower type of circuit.
Bus	Electrical circuit over which power or data is transmitted.
Diode Function Generator	A circuit using diodes as switches for input or feedback resistors. Used to simulate many non-linear functions.
Flip-Flop (FF)	Electronic circuit with two stable states.
Gate	A circuit with two or more inputs and one output, the output depends on the combination of input logic. The gates used in the 380 System are NOR and negative NAND gates.

High-Quality Ground	A separate ground return provided for sensitive computing components. No current flow is permitted, eliminating noise resulting from an IR voltage drop in the wire or bus.
Hybrid	A computer which has both analog and digital capabilities.
Integrated Circuit	The EIA (Electronic Industries Association) defines a semiconductor integrated circuit as: "The physical realization of a number of electrical elements inseparably associated on a continuous body of semiconductor material to perform the function of a circuit".
Inverter	A circuit in which the output logic level is always opposite to the input logic signal.
Logic	Mathematical approach to the solution of involved problems by the use of symbols which define basic concepts. The three basic logic symbols are: "AND, OR, and NOT".
Mnemonic	Pertaining to the assisting of human memory; thus, a mnemonic code is usually an easily remembered abbreviation.
Monitor	To supervise and check the correct operation of a program during its execution. Monitoring equipment available with the 380 System includes indicator lights, visual and audible overload alarms, a digital voltmeter, and an oscilloscope.
Offset	An undesirable voltage appearing at the output of an operational amplifier whose input is held at zero.
Passive Elements	Circuit components with no gain characteristics: resistors, capacitor, inductors.
Peripheral Equipment	Auxiliary units which may be placed under computer control.
Potentiometer; Pot	An adjustable resistor used in analog computers for multiplication by a constant, also called an attenuator.
Real Time	A computing operation speed adjusted so that it can influence the process being controlled.
Register	Device used as a storage element. It may also be made to shift, circulate or perform other operations.
Scale Factor	A number used to multiply or divide quantities so that each desired variable is within the problem parameters.
Stabilizer	A circuit in an operational amplifier that increases dc gain and reduces offset.

1.3 INSTALLATION INFORMATION

1.3.1 Site Preparation

The 380 Analog/Hybrid Computing System requires no specific site preparation. It is designed to operate in normal laboratory, lecture hall, or office environments. The computer is designed for operation on a base such as a desk or table. It is suggested that the base be equipped with casters, simplifying maintenance or relocation of the console. Specific primary power requirements and operating and storage environments are listed in Table 1.1.

Table 1.1. 380 Computer Characteristics

Characteristics	English Units	Metric Units
Operating Voltages	105 Volts AC ±10V 115 Volts AC ±10V 125 Volts AC ±10V	210 Volts AC ±20V 230 Volts AC ±20V 250 Volts AC ±20V
Operating Frequency	50/60 CPS, 1 Ø	50/60 CPS, 1 Ø
Operating Power (Maximum, Fully Expanded)	0.5 kVA	0.5 kVA
Length	43 Inches	109.2 Centimeters
Width (Depth)	21.3 Inches	54.4 Centimeters
Height	24.2 Inches	62.3 Centimeters
Weight (Maximum, Fully Expanded)	310 Pounds	141 Kilograms
Relative Humidity (Operating) (No Condensation)	From 20% to 90%	From 20% to 90%
Altitude	Sea Level to 10,000 Feet	Sea Level to 3 Kilometers
Storage Environment Temperature	From 0°F to 120°F	From -17.8°C to 48.9°C
Relative Humidity (Non-Operating) (No Condensation)	From 20% to 90%	From 20% to 90%
Altitude	Sea Level to 50,000 Feet	Sea Level to 15.2 Kilometers

1.3.2 Uncrating

The computer is normally shipped crated. For domestic shipment, all components are installed (unless otherwise noted in the invoice or marked with caution tags on the computer). Computers packed for foreign shipment usually have all computing trays and certain other components separately packed to minimize the possibility of damage.

After the computer crate is opened (following the instructions attached to the crate), the computer may be positioned on the base.

Figure 1.5 illustrates the major dimensions of the computer. Computers shipped to destinations within the United States or Canada are normally wired for 115 Vac operation unless 230 Vac operation is specifically requested on the Purchase Order.

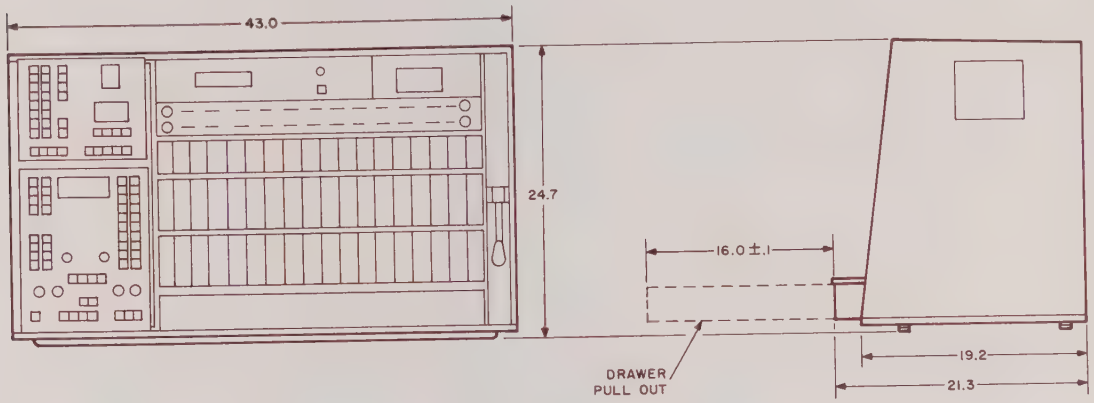
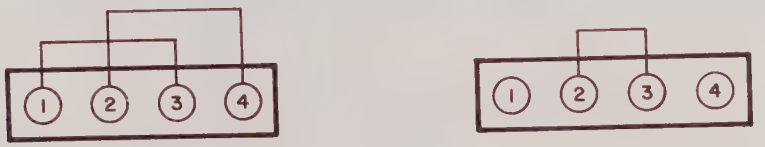


Figure 1.5. 380 Computer Dimensions

Computers shipped to points outside the USA or Canada are normally prepared for operation from a 230 Vac single phase source. Changing from one voltage to another is easily accomplished by changing jumpers on terminal board TB1 (mounted behind the analog control panel). Figure 1.6 illustrates the jumper position for 115 Vac or 230 Vac operation.



(a) 105-125V AC Operation *(b) 210-250V AC Operation*

Figure 1.6. TB1 Jumper Positions

CAUTION

Do not connect the computer to a primary power source until the jumper positions are checked. See Figure 1.6.

1.3.3 Accessory and Trunk Connectors

Accessories for the 380, such as plotter, recorders, etc., are connected to the computer by cabling to the appropriate connector on the I/O connector panel. Figure 1.7 shows the functions terminated at each connector.

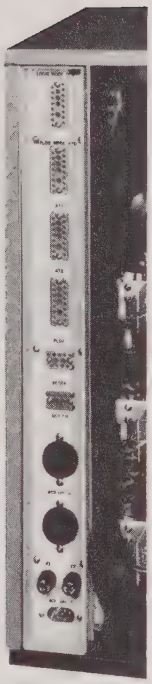


Figure 1.7. Trunk and Accessory Connector Panel

The analog and logic trunks and mode control slave inputs are terminated in this area. Connector AT0 terminates the analog mode slave inputs and 10 analog trunks. Connectors AT1 and AT2 terminate the remainder of the analog trunks. Connector DT0 terminates the digital mode slave inputs and six digital trunks.

NOTE

Prior to operating the computer, check to ensure that these connectors and the power card are in their proper positions and fully inserted.

1.3.4 Insertion of the Patch Panel

Prior to inserting or removing the patch panel the computer should be in either the SP (set pot) mode or OFF. To insert the patch panel, raise the lever arm upward and set the bottom of the patch panel frame into the bottom rail of the patch bay (Figure 1.8). Push the patch panel forward until the frame rests securely in the patch bay. Holding the patch panel in place, push down on the lever. Note that when the lever is moved downward, the patch panel moves to the right, locking it in place.

To remove the patch panel lift the lever arm to release the panel. Grasping the panel by the handles, pull the top out until the panel is at an angle of approximately 45°. The panel can then be lifted out.

1.4 OPERATING INSTRUCTIONS

Table 1.2 briefly describes the functions of the various operating controls located on the 380 Computer Control area. The table also includes references to the chapters in which the various control circuits are described.

Table 1.2. Operating Mode Functions

Control	Function	Refer to:
PP Analog Mode	Provides for control of IC and Op modes from patch panel.	Chapter 3
IC (Initial Condition)	Used to manually control the IC bus.	Chapter 3
HD (Hold)	This switch, when depressed, removes the computer from the PP, IC, or OP modes.	Chapter 3
OP (Operate)	Manually controls the operate mode of the computer.	Chapter 3
SP (Set Pot)	Switches computer to Set Pot mode permitting the setting of potentiometers.	Chapter 3
ST (Static Test)	Switches computer to static test mode to permit checking computed levels at various points in the program.	Chapter 3
RMT (Remote)	This switch, when depressed, permits analog mode selection from an external device.	Chapter 3
POWER-OFF/ON	Controls ac power to computer.	Chapter 8
Time Scale - N/F	Permits selection of integrated time scales.	Chapter 3
Timer A/$\overline{A}$	Provides for adjustment of OP($\overline{A}$) and IC(A) switching rate.	Chapter 3
ADDRESS	Permits selection of any component capable of being addressed for readout purposes.	Chapter 4
VM Function	Provides for selection of voltages to be read out on the VM.	Chapter 4
VM RANGE	Attenuator switch for adjusting the range of the VM.	Chapter 4
COMPARATORS	Provides capability of overriding inputs patched to a comparator.	Chapter 9 Computing Comp Manual
FUNCTION RELAYS	Provides capability of overriding inputs to a function relay.	Chapter 9 Computing Comp Manual

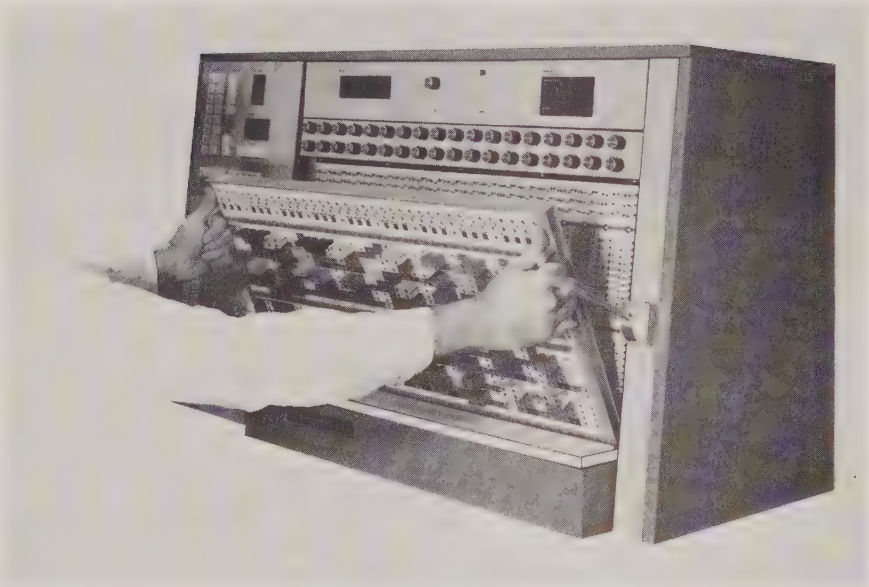


Figure 1.8. Inserting the 380 Patch Panel

1.5 RECOMMENDED TEST EQUIPMENT

The 380 Analog/Hybrid Computing System provides long term accuracy and reliability. However, to maintain the equipment at peak performance, some of the components must be periodically calibrated. Pertinent performance checks and adjustment procedures are provided in the succeeding chapters of this manual, and the computing components manual (as applicable). It is important to note that the computer cannot be more accurate than the equipment used for calibration, plus the accumulated tolerances of the components and the test equipment. Therefore, it is essential that the test equipment meets the minimum standards specified in the following paragraphs.

Types of Equipment:

1. *Precision Voltmeter.* A voltage measuring instrument is essential for component calibration. A device recommended for this purpose is frequently known as a null voltage test set. It incorporates a precision six-place voltage divider and a null sensing galvanometer (or the equivalent). Some units may also include a standard reference cell or power supply. Of course, a separate voltage divider and galvanometer may be combined to accomplish the same function if the voltage divider is sufficiently accurate and the galvanometer has the required sensitivity. In any case,

the device must have an absolute accuracy of ±0.01% of full scale, and have a resolution of 0.005% of full scale. A differential null meter such as the Keithley, Model 662 or the Fluke, Model 825 is recommended by EAI experience, but any instrument meeting the accuracy and resolution requirements may be used.

2. *Multimeter.* A multimeter, VOM or VTVM is useful for troubleshooting. Any unit having a sensitivity of at least 10,000 ohms per volt for dc measurements may be used. The resistance range of a multimeter may be used effectively to locate circuit faults and to perform rudimentary checks of diodes and transistors. The ohmmeter battery should not have a voltage greater than 1.5, since a higher voltage may damage some of the semiconductors. Typical of the instruments that may be used are the Triplett, Model 630 or the Simpson, Model 260.

3. *Oscilloscope.* An oscilloscope is required for many adjustment procedures, in addition to being extremely useful for troubleshooting. For maximum usefulness, the scope should have dual trace capabilities along with direct coupled vertical amplifiers. Typical of the scopes that meet these requirements is the Tektronix 545A with Type CA (dual trace) and Type H (wide-band) plug-in pre-amplifiers.

4. *Sine-Wave Oscillator.* An audio oscillator with a low-distortion, fairly uniform output over the range from about 10 cps to 500 kc is required for several check procedures. A Hewlett-Packard 200 CD is typical of the instruments that meet these requirements.

5. *Triangular-Wave Generator.* Checking the sine-cosine tray requires the use of a triangular-wave generator such as the Wavetek 103.

6. *Digital Voltmeter.* The 380 is equipped with a digital voltmeter that may be used for many checks and adjustments. The internal DVM is slaved to computer reference. This improves the accuracy of the DVM for computing functions (if the computer reference deviates slightly from its absolute value, the DVM shifts in the same direction, thus cancelling any apparent error). However, this renders the DVM less accurate for absolute measurements if the computer reference differs from 10.000 volts. Therefore, an external DVM is very useful for many procedures, and if sufficiently precise, can be used to replace the precision voltmeter listed in Item 1.

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.45.0149 380 Computer (Operating Equipment)	1-19
0.19.0263-1 Test Cable	1-20
0.12.1729-0 Null Panel	1-21

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	AC1	Connector, Receptacle: 2 Contacts; Male (Tower Mfg. Co. H-1061 or equal)	00 542.0888-0	A
2	AC2,3	Connector, Receptacle: 3 Contacts; Female (Harvey Hubbell 5258 or equal)	00 542.1157-0	A
3	F1	Fuse, Cartridge, Slow Acting: 5A, 125V (Bussman MDX5 or equal)	00 570.0056-0	A
4	F2	Fuse, Cartridge, Slow Acting: 3A, 125V (Littelfuse 313003. or equal)	00 570.0112-0	A
5		Connector, Receptacle: 22 Contacts; Female (Amp Inc. 480142-2 or equal)	00 542.1055-0	A
6		Service Shelf	00 051.0382-0	B
7		ANALOG PROGRAMMING KIT: c/o	00 100.0364-0	B
		18 each - Horizontal Plug: 4 Prong	00 005.0172-0	B
		6 each - "T" Bottle Plug: 6 Prong	00 005.0173-0	B
		15 each - Horizontal Plug: 2 Prong	00 005.0174-0	B
		10 each - Cable 6" - Black	00 510.0492-0	B
		15 each - Cable 13" - Brown	00 510.0493-0	B
		10 each - Cable 19" - Orange	00 510.0494-0	B
		5 each - Cable 31" - Blue	00 510.0495-0	B
		3 each - Connector	00 542.0605-0	B
8		SERVICE KIT (115V OPERATION): c/o	00 100.0369-0	B
		1 each - Power Cable	00 510.0040-0	B
		25 each - Contact Spring	00 550.0061-0	B
		5 each - Fuse, Slow Acting: 3A, 125V (Littelfuse 313003. or equal)	00 570.0112-0	A
		5 each - Fuse, Slow Acting: 5A, 125V (Littelfuse 313005. or equal)	00 570.0115-0	A
		5 each - Fuse, Fast Acting: 2A, 250V (Bussman GJV-2 or equal)	00 570.0173-0	A
		5 each - Fuse, Fast Acting: 0.5A, 125V (Littelfuse 273.500 or equal)	00 570.0180-0	A
		5 each - Fuse, Fast Acting: 1A, 125V (Littelfuse 273001 or equal)	00 570.0182-0	A
		10 each - Fuse, Fast Acting: 2A, 125V (Littelfuse 273002 or equal)	00 570.0184-0	A
		1 each - Insertion Tool	00 777.0221-0	B
		1 each - Chassis Extractor Tool	00 777.0239-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
380 COMPUTER
(OPERATING EQUIPMENT)

MODEL NO.
0.45.0149

0

DATE 12 / 19 / 68

Sh. 1 of 2 Sh.

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
9		SERVICE KIT (230V OPERATION): c/o	00 100.0369-1	B
		1 each - Power Cable	00 510.0040-0	B
		25 each - Contact Spring	00 550.0061-0	B
		5 each - Fuse, Fast Acting: 1.5A, 250V (Littelfuse 31201.5 or equal)	00 570.0086-0	A
		5 each - Fuse, Fast Acting: 2A, 250V (Bussman GJV-2 or equal)	00 570.0173-0	A
		5 each - Fuse, Slow Acting: 2.5A, 250V (Littelfuse 31202.5 or equal)	00 570.0174-0	A
		5 each - Fuse, Fast Acting: 0.5A, 125V (Littelfuse 273.500 or equal)	00 570.0180-0	A
		5 each - Fuse, Fast Acting: 1A, 125V (Littelfuse 273001 or equal)	00 570.0182-0	A
		10 each - Fuse, Fast Acting: 2A, 125V (Littelfuse 273002 or equal)	00 570.0184-0	A
		1 each - Insertion Tool	00 777.0221-0	B
		1 each - Chassis Extractor Tool	00 777.0239-0	B
		0.19.0263-1 TEST CABLE		
1	P1	Connector, Receptacle: 22 Contacts; Female (Amphenol 143-022-01 or equal)	00 542.0091-0	A
2	P2	Connector, Receptacle: 22 Contacts; Male (Amphenol 133-022-21 or equal)	00 542.0569-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 12 / 19 / 68

UNIT TITLE
380 COMPUTER
(OPERATING EQUIPMENT)

MODEL NO.
0.45.0149 Sh. 2 of 2 Sh.

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	R1	Potentiometer: 2K ohmw ±5%, 2W @25°C (Bourns 3500S or equal)	00 643.4202-1	A
2		Connector, Receptacle: 12 Contacts (Amp Inc. 480087-1 or equal)	00 542.1058-0	A
3		Switch	00 656.0224-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

NULL PANEL

MODEL NO.

0.12.1729-0 Sh.1 of 1 Sh.

0

DATE 12 / 18 /68

APPENDIX 2

DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

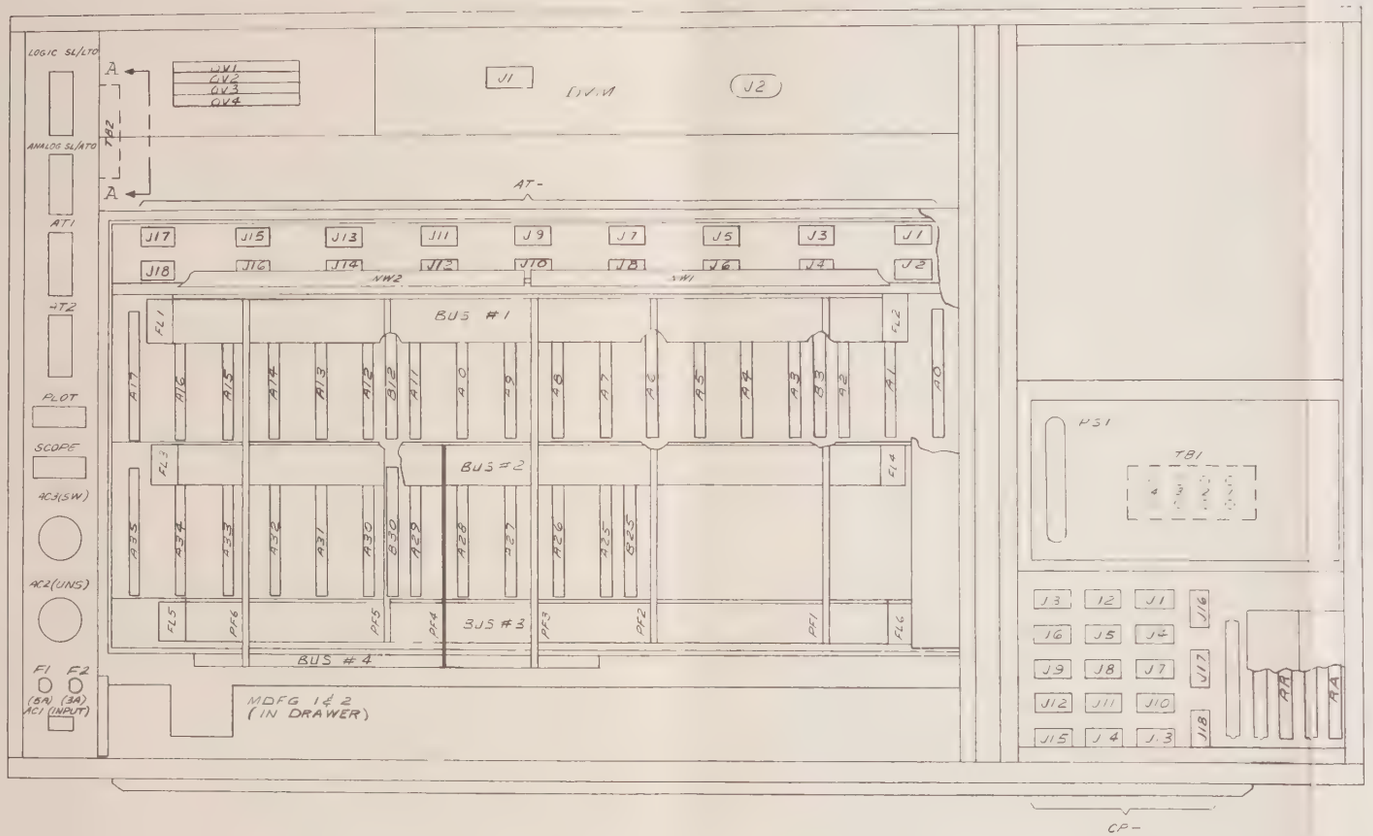
EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

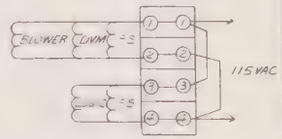
INDEX

Unit or Component	Type of Drawing	Drawing Number
0.93.0076 380 Computer	Wiring	D00 093 0076 0W (Sheets 1 through 9)

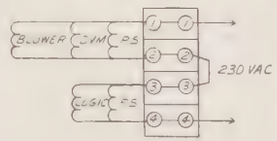
TB2

VIEW A-A





FOR 115VAC OPERATION



FOR 230VAC OPERATION

REAR

BUSS #1 & BUSS #3

1	HR SRD	BLK-WHT
2	-15V	VIO
3	+15V	ORN
4	+30V	RED
5	SGRD	BLK
6	DOT SET	GRN
7	6.3V COM	BRN
8	6.3V HOT	WHT-BRN

BUSS #2

1	+10V	WHT-RED
2	-10V	WHT-VIO
3	-20V	GRY
4	+5V	GRN-WHT
5	DIG.RD	GRY-BLK
6	DP	BLU
7	I/C	YEL
8	TS	WHT

RELEASED FOR PRODUCTION — DATE 2-6-68

REVISIONS

	Rel. 1
	CKT. 8
	REVD SHT 6 #17 JAN 69 ERN 380-054-A
	REVD SHT 6 #17 JAN 69 ERN 380-54-A
2	REVD. SHT 5. #17 JAN 69 ERN 380-054-A
	REVD. INT 8. #17 AUG 68 ERN 380-058-A
	REVD SHT 9 #25 FEB 69 ERN 380-055-0
	REVD SHTS 5 & 8. #11 MAR 69 ERN 380-074-0

EAI ELECTRONIC ASSOCIATES, INC. Port Long Branch, N.J.

WIRING
WIRED, RACK
(380)

MATERIAL:	SEE PARTS LIST A00 093 0076 OP
FINISH:	
DWG. NO. SIZE	A00 093 0076 OP
SCALE	
DRAWN C. BRUNO	DATE 20CT68
CHK'D J. MEFFA	DATE 26 NOV 68
DSGR	DATE
APPD	DATE
SHT NO	1 2 3 4 5 6 7 8 9
SIZE	D
REV NO	0 0 0 3 1 0 3 1
PROJECT 103105	D00 093 0076 OW
SHEET 1 OF 9 SHEETS	

UNLESS OTHERWISE SPECIFIED
DIMENS ONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: X = ± .03 .XX = ± .01 .XXX = ± .005 ∠ = ± 1°
* TOL OF MATERIAL SUPPLIED

CHAPTER

2

CHAPTER 2

GENERAL MAINTENANCE INSTRUCTIONS

2.1 GENERAL INFORMATION

This chapter provides the maintenance technician with general information concerning the 380 Computing System. The Computing Components manual of this series (EAI Publication Number 00 800.2066-0) provides a specific maintenance guide for each individual tray.

The technician is referred to the following: (a) Reference Handbook for patching procedures of the various computational components (EAI Publication Number 00 800.2064-0); and Applications Reference Library Bulletins available through the EAI Advertising Department, West Long Branch, New Jersey.

2.2 PREVENTIVE MAINTENANCE

The primary goal of preventive maintenance is to minimize downtime. This is accomplished by a systematic check of the equipment to detect any decline in performance. Detailed and carefully maintained records and malfunction reports should be kept. These records (if carefully analyzed) will provide information to evaluate a given maintenance program. This permits the maintenance technician to establish an efficient program for his particular installation.

The preventive maintenance routines are divided into two groups. These groups are frequent (daily to weekly) checks, and infrequent (semi-annual) checks.

2.2.1 Daily to Weekly Checks

1. The computing and maintenance areas should be kept clean. Dirt and loose or foreign objects can cause malfunctions. Recorders and plotters should be covered when not in use.
2. All power supplies should be checked for nominal magnitude.
3. All operational amplifiers should be checked and balanced when necessary.
4. The reference supplies should be checked for 10 volts nominal magnitude, ripple, and noise.
5. Check the DVM for proper warm-up (1/4 hour).

6. Check derivitive amplifier balance.
7. All recording equipment should be checked for ink and paper supply as well as for general operating conditions and calibration.
8. The readout functions should be checked for operation.
9. Make certain that all equipment necessary for scheduled operation is available and in operating condition.

2.2.2 Semi-Annual Checks

1. Complete all daily checks.
2. Check slaving capabilities.
3. Check all amplifiers for offset and load current.
4. Perform a dynamic check on all multipliers, and function generators.
5. Check DVM display lamp operation.
6. Check the display oscilloscope for overall operating condition.
7. Check potentiometers for manual setting.
8. Check the following:
   - All air filters.
   - Accuracy of all resistors.
   - Accuracy of integrators.
   - Comparator sensitivity and operation.
   - All trunks for continuity.
9. Service plotting equipment and check recorder frequency response.
10. Check DVM calibration.

EAI maintains a highly trained and skilled Service Engineering staff that is available to a customer on two terms: either resident or temporary basis. The suggested preventive maintenance routines are based on the experience of this staff in both EAI Computation Centers and customer installations throughout the world.

2.3 SERVICE TECHNIQUES

The following suggestions and techniques are given to aid maintenance personnel who are not yet familiar with the servicing of transistorized equipment.

2.3.1 Etched-Circuit Board Soldering

The techniques and precautions employed while soldering any electronic equipment apply to etched-circuit boards; however, several additional factors should also be considered.

Wire leads or components fastened to the board by their leads may be replaced in the following manner:

1. If a component (IC can, transistor, etc.) is to be replaced, remove it with a pair of "flush cutters" by clipping the leads as high, and as close to the "can" as possible (Figure 2.1). Remaining now are only the wire leads.

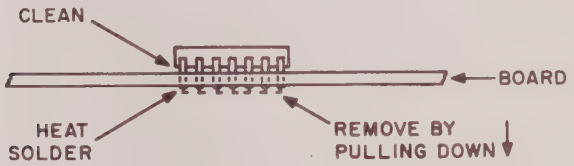


Figure 2.1. Removal of Flat Pack

2. Grip the lead to be removed with a pair of long nosed pliers. While applying pressure to the lead, touch a well-tinned, small (40-watts or less) soldering iron to the fillet. If the lead does not slip out easily, remove the soldering iron and insure that the correct fillet is being heated.
3. Clear the excess solder from the hole by briefly touching it with the iron and then carefully pushing it out with a soldering aid (CG Electronics Number 9093). For plate-through holes, a vacuum type soldering iron is recommended. In most cases, a hollow point soldering iron with a manually operated vacuum bulb (ENDICO, Model 300 pencil de-soldering iron) is sufficient.
4. Bend the leads on the new components or jumper to fit the board connections, and insert the component without cutting the leads.
5. With the component held in place, touch the iron to the lead allowing solder to run down the lead and form a fillet. As soon as fillet is formed, remove the iron. It is not necessary to completely fill the hold with solder as some components (transistors, diodes, etc.) are easily damaged by excessive heat.
6. When all leads have been soldered, cut the lead off as close to the board as possible (flush cutters). Carefully scrape off excess flux and solder from the board with a soldering aid.

Removal of the components is much easier if special soldering iron tips such as the Ungar Electric Tool Number 856 (5/8 inch diameter cup) and Number 858 (bar) are used. These tips are used for component *removal* only, and permit all leads to be freed together.

If the above procedures are followed, no trouble with the etched conductor itself should be encountered. If, however, a conductor becomes cracked it may be repaired by carefully soldering a tinned piece of bus wire over it. Again, extreme care should be taken not to overheat the strip and cause it to separate from the board.

2.3.2 Transistor Servicing

Most transistors are mechanically rugged, but they can be damaged by excessive heat. If it becomes necessary to solder near a socket mounted transistor, the transistor should be removed to prevent damage. When it is soldered to the board, extreme care should be taken to prevent overheating. Always use a small, well tinned soldering iron, and work as quickly as possible.

Transistors and diodes soldered directly to the board should be removed only when there is strong reason to believe they are defective. When soldering transistors or diodes, a heat sink should be used on each lead as it is soldered. Two common methods of heat-protection for these components are (1) holding the lead with a pair of long-nose pliers or (2) by clipping an alligator clip (the jaws filled with solder) on the lead.

Power transistors are often mounted on metal chassis plates, which function as heat sinks, to dissipate the heat generated during normal operation. The metal case of a power transistor is usually the collector and operates at a relatively high voltage. Because of this, power transistors must be electrically insulated from the heat sink but still allow heat transfer to the sink. A common method of accomplishing this is by using a mica, anodized aluminum, or fiberglass washer with silicon grease. The washer provides electrical insulation and the silicon grease increases the heat conduction. When replacing the power transistor, use only a single washer and coat both sides with silicon grease; Dow Corning Number 340 Compound, EAI 00 942.0025-0 (or equivalent). As a final precaution before applying power to the unit, check the resistance between the body of the transistor and the heat sink to ensure that no short or high resistance leakage patch exists between these points.

Diodes, electrolytic capacitors, and the transistors themselves used in transistor circuits are frequently damaged by voltage overload. Transistors should never be removed or inserted with power applied, and special care must be taken in the selection and use of test equipment. Signal generators commonly used in servicing vacuum tube circuits are often capable of producing enough output to overload and permanently damage the diodes, electrolytic capacitors, and transistors of the type used in transistor circuits. Always start with the minimum output signal and slowly increase it to the desired level.

The meter used for continuity and resistance checks must be carefully chosen. Some ohmmeters use batteries with a higher voltage rating than the transistors and capacitors being checked, and can destroy them. A meter with a 1-1/2 volt battery is recommended. In order to prevent damage to the small electrolytic capacitors it is essential to determine the polarity of the ohmmeter leads. This may be accomplished with another meter set to a low dc scale.

2.3.3 Transistor Troubleshooting

As with any other type of electronic circuit, the first step in troubleshooting transistor circuits is a visual inspection for charred, discolored, or leaky components; broken, shorted, or loose connections; heavily tarnished or broken connectors; and physical damage to the board itself. The next step is to replace any relays, ovens, or choppers, which are socket mounted on the board, with units known to be good. This is done not only because it is fairly easy, but also because each contains mechanical moving parts which may fail due to normal wear. If the trouble is not located by either of these steps, the board may be dynamically tested by applying all supply voltages and a signal input and then checking voltages and signals on the board until the trouble is isolated. If dynamic testing is impossible due to the lack of suitable test equipment, or availability of "down time" on the equipment in which it is used, the trouble can usually be located through resistance and continuity checks.

Refer to the schematic when making resistance checks to be sure that meter polarity is correct for any electrolytic capacitors in the circuit and that parallel dc paths are not affecting the readings. When the board is removed many components are naturally isolated by the plug or pin connections. Others are effectively isolated by capacitors in series with them. When it becomes necessary to unsolder and lift one end of a component from the board to isolate it for resistance checks, resistors should be chosen whenever possible. Resistors are least likely to be damaged by heat. In many cases, by carefully selecting the correct lead to disconnect, several components may be isolated at one time.

It is not usually necessary to risk overheating a transistor by unsoldering it to make resistance checks. For example, lifting one end of the collector load resistor and one end of the emitter resistor would effectively isolate the transistor in a normal transistor amplifier stage.

Once a transistor is isolated, it may be checked using the following procedures:

1. Set the ohmmeter to a high range and connect it between the base and the collector leads; reverse the leads and note which connection caused the higher reader. This is the reverse-bias direction.

2. Connect the ohmmeter to reverse-bias the transistor and note the reading. Short the base to the emitter. The reading should decrease. Remove the short.

3. Move the lead on the base to the emitter and note the reading. Reconnect the short, the reading should increase.

This test will indicate a burned-out transistor but not a weak or high-leakage transistor. If a transistor is still suspected, and no other troubles are found, substitute one known to be good.

2.4 TROUBLESHOOTING

This paragraph describes some of the convenient troubleshooting aids provided in the 380 System and outlines a few basic procedures for the technician who is not thoroughly familiar with the system.

CAUTION

When replacing trays refrain from ramming or forcing mating connectors together. A slight misalignment (or inadvertently placing the tray in the wrong slot) can cause connector blocks to crack if subjected to undue force.

First, ensure that primary power is applied and that all cables are properly connected. Actual ac hookup is dependent upon site requirements; the technician should have an accurate diagram of the ac hookup at time of system installation.

If the programmer reports a malfunction during a problem run, the technician should request a copy of the programmer's computer diagram, amplifier and attenuator assignment sheets, etc. The technician should be familiar with both Analog and Digital programming symbols and various programming notations in order to obtain maximum information from the data.

Because the console is a completely self-contained computer, disconnection of the peripheral gear will locate the faults in either the console or the peripheral equipment. Once the major component is located, maintenance information concerning that unit may be found in the respective handbook, and/or chapter within the 380 Maintenance manuals. Refer to the index and list of associated manuals at the front of the 380 Reference Handbook (EAI Publ. No. 00 800.2064-0).

The DVM, and monitoring oscilloscope are also very useful in troubleshooting. When a particular tray is suspect, interchange it with an identical unused tray and, if the trouble clears, the fault is isolated to the replaced tray. If the trouble remains, the patching is probably in error. If an unused tray is not available, switch position with an identical unit that is in use and check to see if the malfunction follows the tray.

Another method is to remove the patching from the suspected unit and patch in its place, an identical unit. If the trouble is cleared, repatch the original unit back into the problem to ascertain that some unnoticed patching error was not rectified in the change.

2.5 MAINTENANCE EQUIPMENT

In the 380 Computing System, most components are mounted on plug-in cards and/or trays. This allows rapid replacement of a defective unit with a spare unit. The interruption to computation is brief, actual repair of the defective unit can then be made at the convenience of the technician. With this concept, it is necessary to maintain a supply of spares. The use of spares, on a regular rotational schedule, allows regular computer components to go through preventive maintenance with little or no computer down-time. A recommended spares list may be purchased from EAI to suit a specific customer installation. An extraction tool (EAI 00 777.0239-0) for removal of the plug-in trays behind the patch panel is available from EAI.

CHAPTER

CHAPTER 3

COMPUTER MODE, TIME SCALE, AND REP-OP TIMER CONTROL SYSTEM

3.1 INTRODUCTION

The modes of the analog computer are manually controlled by pushbuttons on the analog control panel (Figure 3.1) or by patching logic signals to the proper patch terminals on the 0.12.1700 Control Tray (Figure 3.2). This chapter describes the analog modes, time scale, rep-op timer and the 0.12.1700 Control Tray.

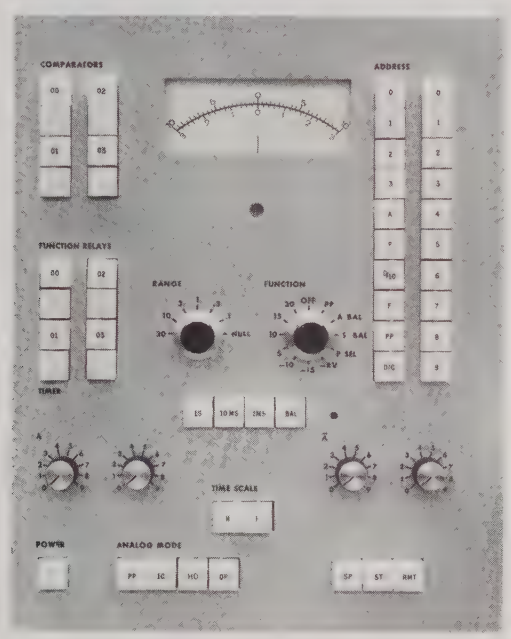


Figure 3.1. Analog Control Panel

3.2 ANALOG OPERATING AND SETUP MODES

The analog portion of the computer can be placed in any one of three operating modes and any one of three setup modes. These modes, and the corresponding computer functions are summarized in Tables 3.1 and 3.2.

Several alternate methods of controlling the computer modes are also available. For example, if two or more computers are slaved together, the mode selection pushbuttons on the keyboard of *any* computer can be used to control the modes (except for ST) of *all* computers. If the PP pushbutton is depressed, the appropriate computer operating modes are controlled by inputs patched to the 0.12.1700 Control Tray.

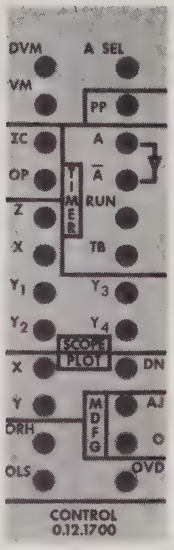


Figure 3.2. Control Tray, Model 0.12.1700

Table 3.1. Definitions of Computer Operating Modes

Mode	Function
OPERATE *(OP)*	Integrators operate; Computer produces a dynamic solution to a patched problem.
HOLD *(HD)*	Integrators do not operate; all values present at the time the *hold* mode is selected are retained.
INITIAL CONDITION *(IC)*	Integrators are set to initial values.

Table 3.2. Definition of Computer Setup Modes

Mode	Function
STATIC TEST *(ST)*	Similar to *initial condition*. Static test voltages can be applied to integrators not normally provided with initial condition voltages, to permit checking computed levels at other parts of the program via Function Relays. All INT and T/S are forced to *IC* mode.
SET POT *(SP)*	All amplifiers provided with low impedance feedback to provide correct attenuator loading. Reference voltage applied to high end of any pot selected for readout, so that the pot coefficient may be read out.
PROGRAM PANEL *(PP)*	When this button is depressed the *IC*, *HOLD*, and *OPERATE* modes may be controlled by logic signals applied to the 0.12.1700 Control Tray patch block. This mode also causes the internal timer to automatically start operation.

3.3 ANALOG MODE AND TIME SCALE CONTROL

Figure 3.3 is a simplified block diagram showing the analog mode and time scale control circuits. The analog control panel mode select inputs (or mode selection inputs from an external control device) are connected through a binary coder to a three-bit storage register. The flip-flops in the registers are set into a different code for mode selection. A decoder circuit following the register provides an output for each mode, and includes drive circuits that light the pushbutton for the selected mode. The appropriate analog control panel pushbutton lights, even when the mode is selected remotely.

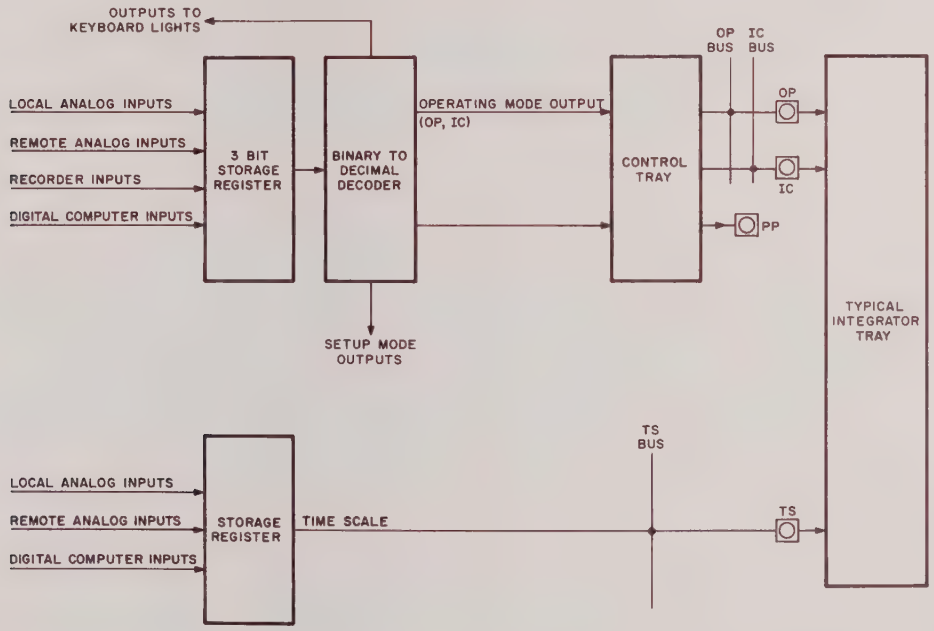


Figure 3.3. Analog Mode and Time Scale Control Circuits, Block Diagram

The outputs representing the setup modes (SP and ST) are connected to various points in the computer requiring setup control. The signals for the operating modes (OP and IC) and the patch panel control enable signal (PP) are connected to the control tray. A separate signal is not required for hold, since when both the OP and IC signals go low it is recognized as a *hold* selection, according to the following truth table:

		Mode Selected			
		OP	IC	IC	H
Signals	OP	1	0	1	0
	IC	0	1	1	0

Note from the truth table that the IC signal overrides the OP signal; if the OP signal is held at binary ONE, the integrators may be switched between the OP and IC modes by switching only the IC signal.

If the PP signal is high, gating circuits in the control tray permit mode selection signals patched to the OP and IC terminals to control the integrators. If nothing is patched to these terminals, the integrators are automatically switched between the IC and OP modes at a rate determined by the analog timer circuits. The OP and IC output signals from the control tray are connected through bus bars and patching terminations to the integrator control circuits. However, individual integrators may be controlled independently by applying a signal (external to the tray) to the IC and OP control circuit inputs. A detailed description of the integrator control circuits is provided in Chapter 3, Section 1 of the 380 Computing Components Manual (EAI Publication Number 00 800.2066-0).

The analog time scale selection circuits are shown at the bottom of Figure 3.3. The integrators in the 380 may operate at one of four time scales as selected by analog control panel pushbuttons, by an external device, and by integrator patching as shown in Figure 3.3. The selection signals are stored in a register. The output of the register is connected to the TS bus line which controls the TS relay in the integrator circuit. In the de-energized state the integrator is in the NORMAL mode. In the energized state the integrator is in the FAST mode. By patching the FAST terminals (on the integrator patch block) together the four different time scales can be accomplished. Table 3.3 indicates the different combinations and the resulting integrator time scales.

Table 3.3. Integrator Time Scales

Selection Signal	Integrator Fast Terminals Patched Together	Integrator Time Scale	Gain With Gain 1 Input
N	YES	1.0 SEC	1
F	NO	0.1 SEC	10
N	YES	2.0 MS	500
F	NO	0.2 MS	5000

These time scales refer to a standard integrator, with an input of 100k ohms. For example, if the NORMAL pushbutton is depressed and the fast terminals on the integrator are patched together the output of the integrator changes by 1 volt per second per volt input.

3.4 THEORY OF OPERATION

The following paragraphs describe the analog mode selection, time scale, analog timer, and the 0.12.1700 Control Tray. For ease of description these circuits are described separately.

3.4.1 Analog Mode Selection

The circuitry for the analog mode selection system is shown in Figure 3.4.

NOTE

Since the mode switches are momentary contact, they must be held in the pushed position while checking the logic levels at the input side of each flip-flop.

The selection of a mode is initiated by depressing one of the analog mode pushbuttons on the keyboard. If two or more computers are slaved together, any computer in the group can control the modes (except ST) of the other computers if their remote (RMT) pushbutton has been depressed. Once a particular mode pushbutton has been activated, the OR gates set or clear their respective flip-flops. A combination of flip-flop outputs forces all of the inputs of the AND gate for the mode selected to go low and its output is high. Since all of the circuits on the mode control card are similar, only the IC mode is discussed in detail. When the IC mode pushbutton is depressed, the input (Pin 14) of Gate 3a/4a and its output (Pin 2) both go high. The clear input of FF1 goes high forcing its 0 output terminal to go low. The high output of the IC switch is also connected to inputs on Gates 2a/4a and 1a/4a. The outputs of these gates force the set output (1) of FF2 and FF3 to a low. The low signal from the set outputs of FF2 and FF3 and the low signal from the clear output of FF1 are connected to Pins 2, 1, and 14 respectively of AND Gate 7a. The three low level inputs on this gate forces its output and the IC output line high. The output of Gate 7a is also connected to Inverter 5c. When the IC output goes high the output (Pin 5) of Inverter 5c goes low, effectively grounding the input end of R5. The -20 volts through R6 to the base of Q2 turns the transistor on grounding DS2 through the collector emitter patch and the lamp lights.

All of the mode control signals (except for the hold signal) are connected to the 0.12.1700 Control Tray. (Although a hold signal is generated it is not used since the lack of an IC and OP signal automatically places the computer in the hold mode.)

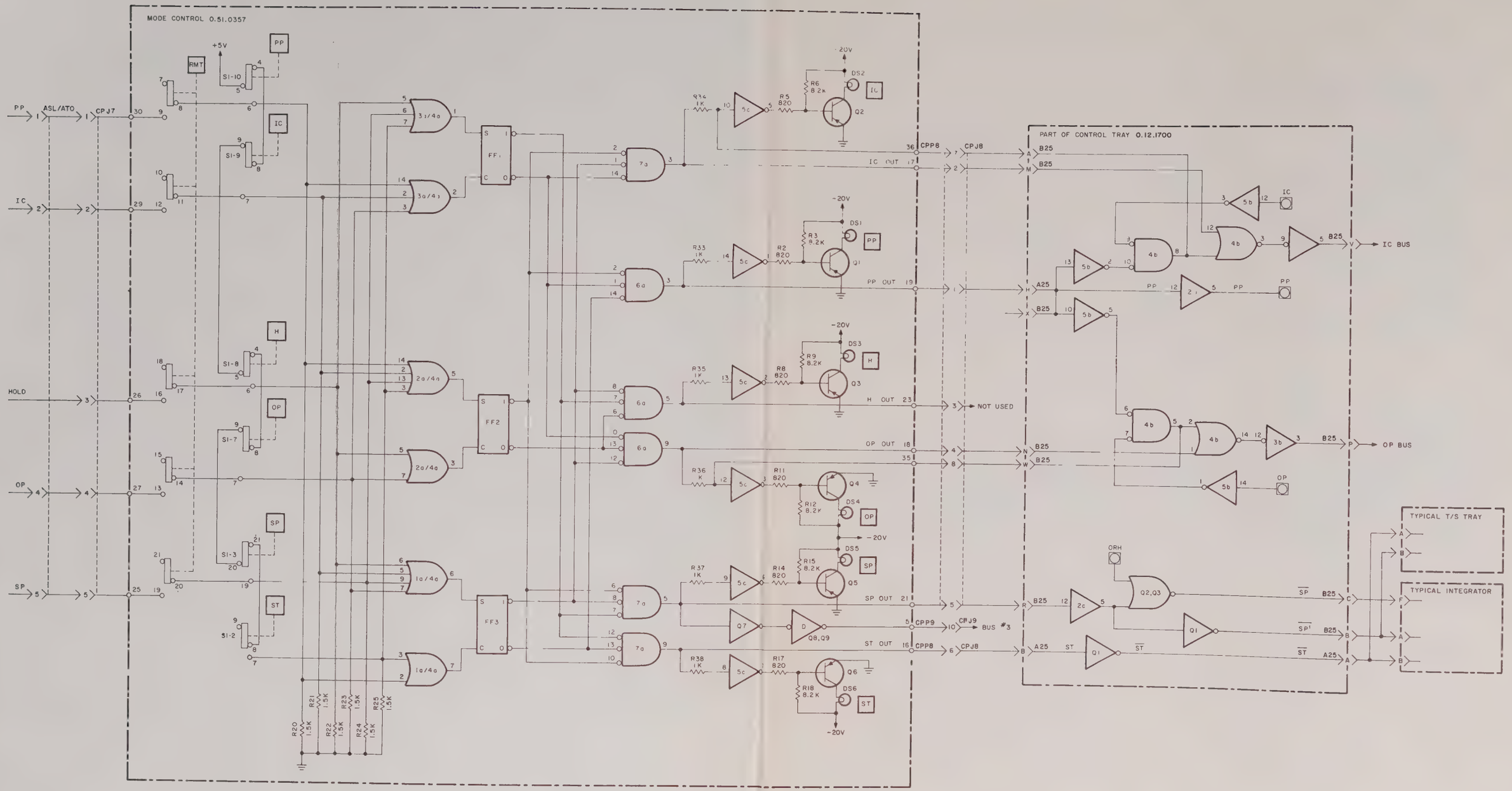


Figure 3.4.
Analog Mode Selection System,
Simplified Schematic

AMPL OUTPUTS, T/S & INTEGRATOR SELECT LINES
0.18.1542

A1	A2	A3	B3	A5	A6	A7	A8	BUS #1	BUS #2	NW1
X A00									BLK	44
B A01									BRN	45
	Y D00								YEL-BRN	41
	X D01								BRN-YEL	40
		X A02							RED	46
		B A03							ORN	48
			X A04						YEL	52
			B A05						GRN	53
				X A06					BLU	58
				B A07					VIO	59
					Y D06				WHT-GRN	55
					X D07				GRN-WHT	54
						X A08			GY	64
						B A09			WHT	65
							Y T/S 08		WHT-BLU	61
							X T/S 09		BLU-WHT	60
								5 ± GRD	BLK	39
									3 -20V GY	36

A10	A11	A12	B12	A14	A15	A16	A17	
X A10								BLK 70
B A11								BRN 71
	Y D10							YEL-BRN 67
	X D11							BRN-YEL 66
		X A12						RED 72
		B A13						ORN 74
			X A14					YEL 78
			B A15					GRN 79
				X A16				BLU 84
				B A17				VIO 85
					Y D16			WHT-GRN 81
					X D17			GRN-WHT 80
						X A18		GY 90
						B A19		WHT 91
							Y T/S 18	WHT-BLU 87
							X T/S 19	BLU-WHT 86

A28	A29	A30	B30	A32	A34	A35	NW2
X A20							BLK 37
B A21							BRN 38
	Y D20						YEL-BRN 34
	X D21						BRN-YEL 33
		X A22					RED 39
		B A23					ORN 41
			X A24				YEL 45
			K A25				GRN 46
				X A26			BLU 51
				B A27			VIO 52
					X A28		GY 57
					B A29		WHT 58
						Y T/S 28	WHT-BLU 54
						X T/S 29	BLU-WHT 53

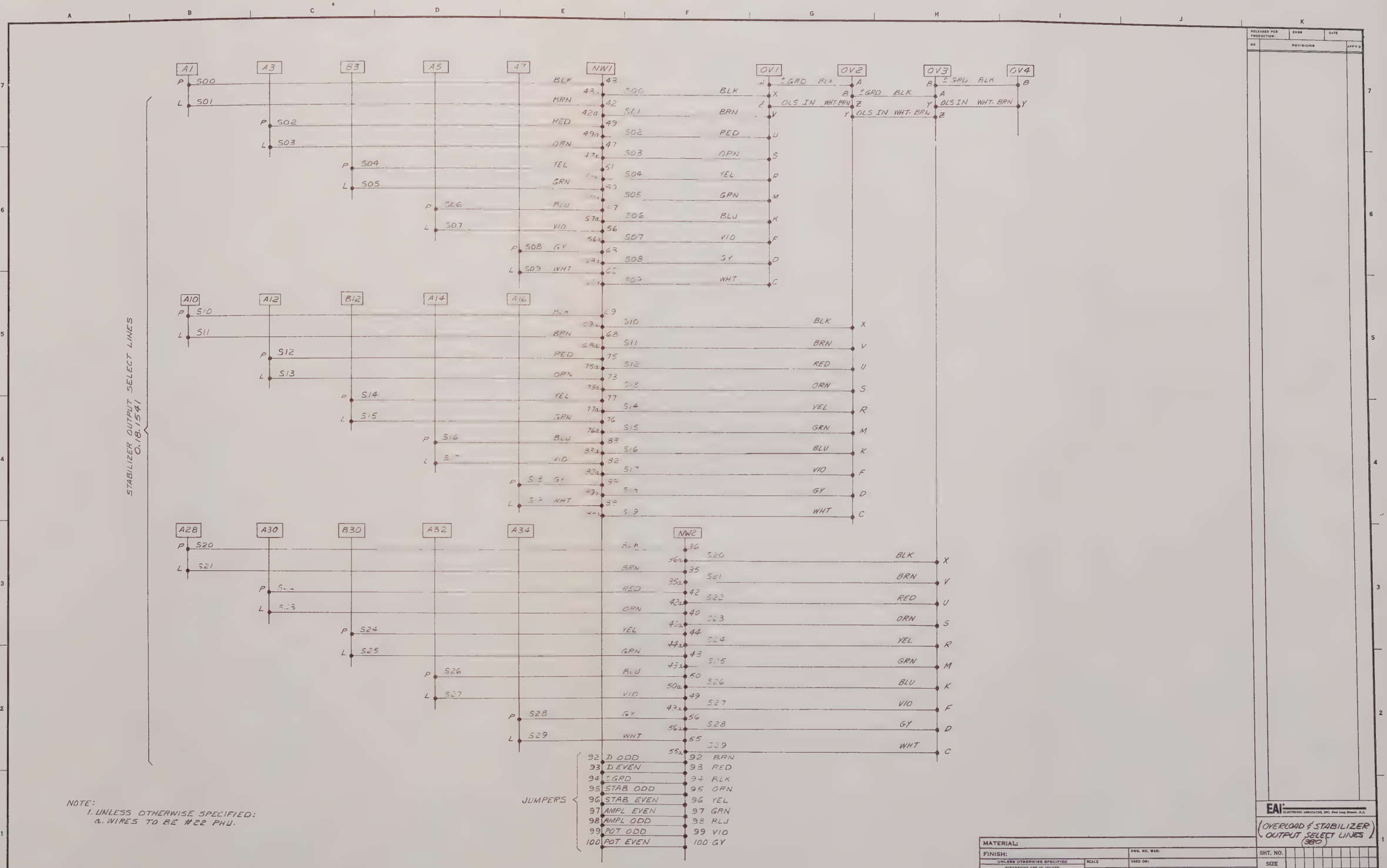
NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a. WIRES TO BE #22 PHU.

RELEASED FOR PRODUCTION:	ENGR	DATE
NO.	REVISIONS	APP'D

EAI: ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

OUTPUT T/S & INTEGRATOR SELECT LINES (380)

MATERIAL:		DWG. NO. WAS:				SHT. NO.	
FINISH:						SIZE	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.010 .XXX = ±.005 ∠ = ±1° *TOL OF MATERIAL SUPPLIED	SCALE	USED ON:				REV. NO.	
	DRAWN	DATE	RCDR	DATE		PROJECT 103105	D00 093 00760W
	CHED	DATE	REVWD	DATE		SHEET 2 OF SHEETS	
	DSGR	DATE	APPVD	DATE			



NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a. WIRES TO BE #22 PHJ.

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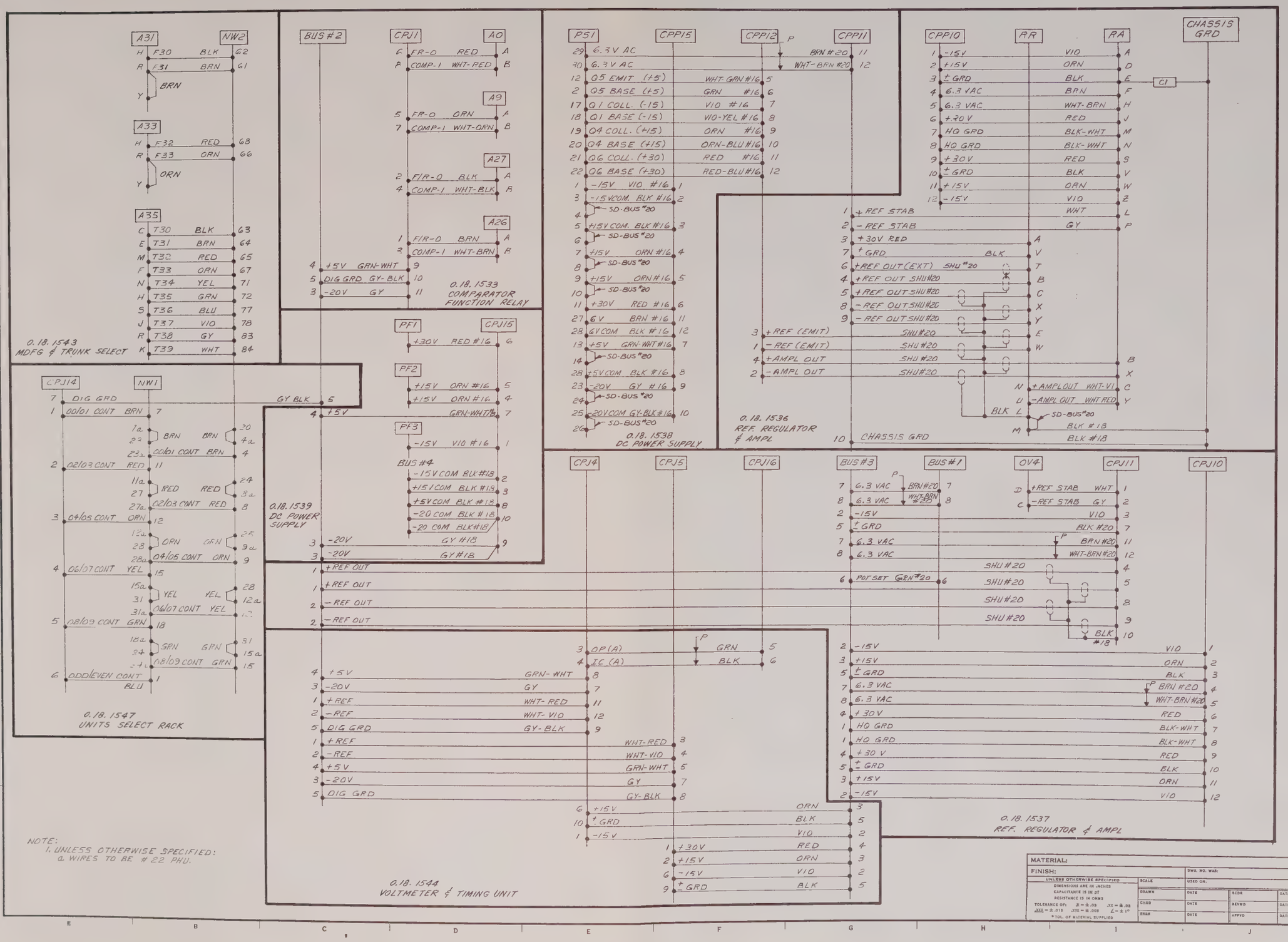
NO — REVISIONS — APPV'D

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

OVERLOAD & STABILIZER OUTPUT SELECT LINES (380)

MATERIAL:			
FINISH:	DWG. NO. WAS:		SHT. NO.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS TOLERANCE ON: .X = ± .03 .XX = ± .01 .XXX = ± .010 .XXX = ± .005 ∠ = ± 1° *TOL. OF MATERIAL SUPPLIER	SCALE	USED ON:	SIZE
	DRAWN / DATE	SCDR. / DATE	REV. NO.
	CHKD / DATE	REVWD / DATE	PROJECT 103105 D00 093 0076 0W
	DSGR / DATE	APPVD / DATE	SHEET 4 OF SHEETS



NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a. WIRES TO BE # 22 PHD.

NO.	REVISIONS	APP'D
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2	BUS #3-6 TO BUS #1-6 WAS NOT SPECD. 17 Feb 69 ERN 380-054-1	G. V.
3	AREA I-7, ADDED C1 RR-T WIRE WAS WHTRD. OV4 PINS C & D WERE INTERCHGD. 11 MAR 69 ERN 380-074-0	G. V.

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(PS, REF. REG, UNITS SELECT, V.M., T.U. MDFG & TRK SELECT LINES (380)

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .003 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

DWG. NO. WAS:
SCALE — USED ON
DRAWN — DATE — RCDR — DATE
CHKD — DATE — REVWD — DATE
ENGR — DATE — APPVD — DATE

SHT. NO.
SIZE
REV. NO.
PROJECT 103105 D00 093 0076 0W
SHEET 3 OF SHEETS

CONTROL 0.18.1534 WIRING

A25	B25	CPJ8	CPJ9	CPJ6	BUS #2	CPJ15	MDFG #2	CPJ3	PLOT	SCOPE	CPJ17	CPJ16	CPJ2
X TU OP											P		
Y TU IC											A GRN	1	
B ST IN	WHT	6	4 DIG GRD	GY-BLK	5		25 -12V OUT				A BLK	2	
C OVLD			BLU	2	4 +5V				GRN-WHT 1				BLU-WHT 2
W RUN												CPJ14	
H PPIN	X	1										RED-BLJ 2	
D +5V				GRN-WHT	4		41 SP MDFG					BLU 5	
+5V GRN-WHT	D		2 +5V	GRN-WHT	4								WHT-GRN 4
T DIG GRD				GY-BLK	5			4 D SEL				NW1	
DIG GRD GY-BLK	T		3 DIG GRD	GY-BLK	5			5 P SEL				BLU 37	
E OVLD DR						BRN 11		11 TENS "0"				WHT-ORN 2	
U F SEL												BLK 19	
S/F SEL				GRN-RED 1	3 -20V							GRN-RED 38	
					5 DIG GRD								GY 5
J SEG SEL							YEL 16	10 TENS "1"					GY-BLK 6
K SET UP AMPL OUT							YEL 18					BRN 35	
S TC RELAY							WHT-BLU 28						
V -12V IN (SW)							WHT-BLU 17			11			
-12V IN (SW)													WHT-BLU 1
L F SEL (DVM)								BLK-YEL 3					
Z ASEL								BLK-YEL 7				3	
N Y4										1			
P Y3										2			
R TB													WHT-BLU 9
M PEN DN									GRN 7				
F OLS WHT-BRN	F			5 S BAL									BLU-WHT 10
N OP IN	P BLK	4		S BAL			BLU-WHT 9						
M IC IN	YEL	2		3 VM (P SEL)				GY 6	3				
E Y PLOT									5				
H X PLOT									11				
Z DVM (PP SEL)								GRN 2	4	3			
J Y2										4	DVM P1		
K Y1									V10 9				
L -X (SCOPE)													
A IC IND.	P WHT	7		1 +10V					WHT-RED 6				
W OP IND	BLK	8		1 +10V						WHT-RED 6			
Y VM			BLU-RED 4	1 +10V									WHT-RED 2
				2 -10V					WHT-V10 9				
				2 -10V						WHT-V10 5			WHT-V10 5
P OP BUSS	P BLU	6		2 -10V								NW2	
V IC BUSS	YEL	7						1 DVM IN			V10 1		
U -20V	GY	3						8 TENS "3"				ORN 32	
								9 TENS "2"					
S Z OUT			1 -20V	GY	3			BUS #4				RED 16	
R SPIN										BRN 8			
SPIN WHT-GRN		5							WHT-GRN 8				
			6 NULL IN										
													GRN 6
								± GRD					
												BLK #18 3	
				BUS #3								OV4	
			10 SP(-20) GRN		6	12 ±GRD						BLK #18 A	
					3 +15V								ORN 7
					5 ± GRD								BLK 8
					2 -15V								V10 9
					6 SP								GRN 3
				MDFG #1				± GRD					
F OLS IN												BLK #18 A	
													WHT-BRN Z
				9 BAL			9 BLU-WHT	± GRD BLK #18	10				
				16 SEG SEL			16 YEL	± GRD		BLK #18 7			
				17 -12V SW			17 WHT-BLU						
				18 SET UP OUT			18 YEL						
				25 -12V			25 BLU-WHT						
				27 DIG GRD SW			27 GY-BLK						
				28 -12V SW TC			28 WHT-BLU						
				41 POT SET			41 WHT-GRN						

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a.) WIRES TO BE #22 PHU.
   b.) COAX PER B00 916 0001 0.

RELEASED FOR PRODUCTION	ENGR	DATE
NO	REVISIONS	APP'D
1	B25-P & B25-V WIRE COLORS WERE GRN & BLK RESP.	

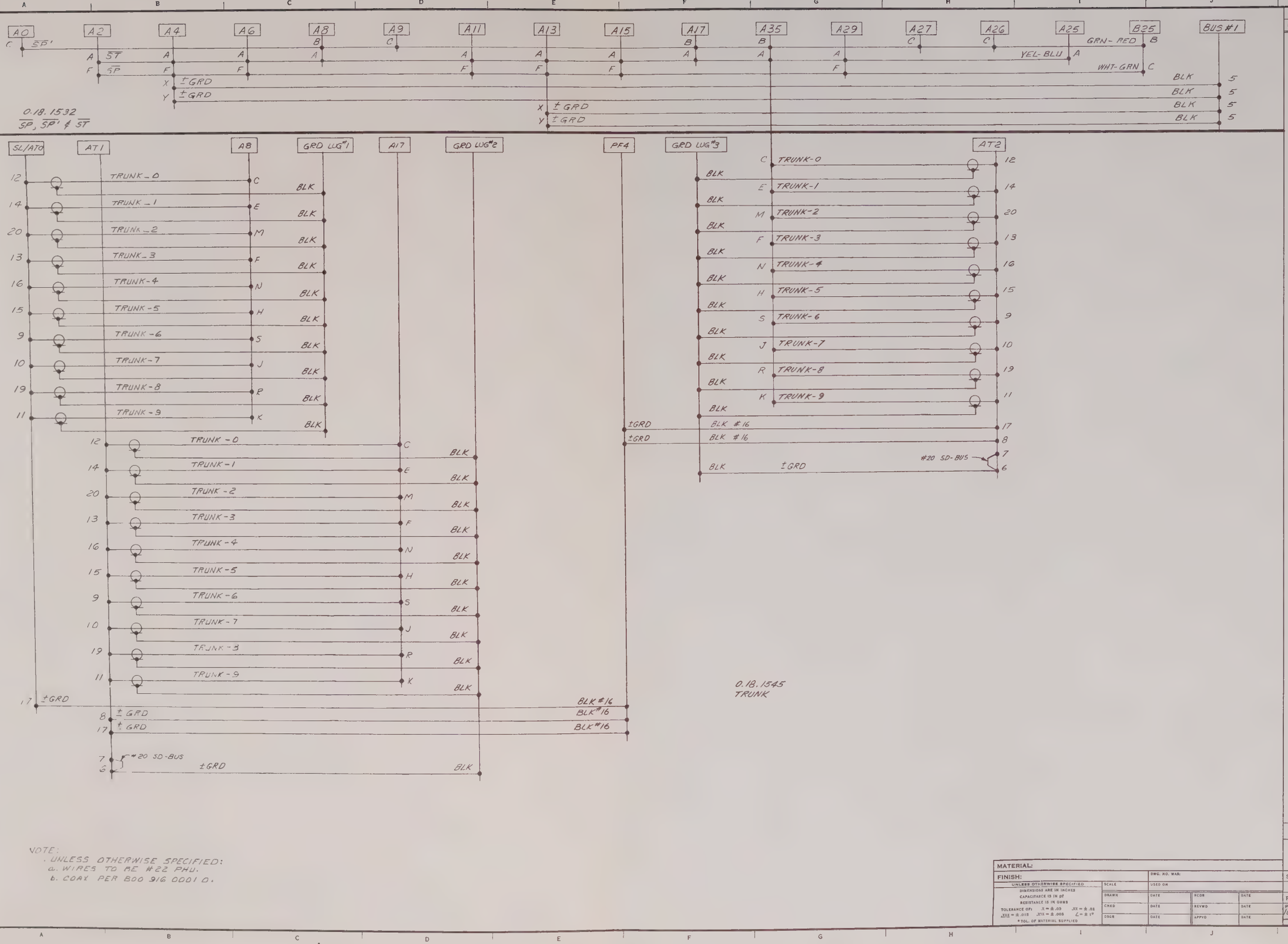
MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .03 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

SCALE | USED ON: | DWG. NO. WAIH
DRAWN | DATE | RCDR | DATE
CHKD | DATE | REVWD | DATE
DSGR | DATE | APPVD | DATE

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

(CONTROL HARNESS)
(380)

SHT. NO.
SIZE
REV. NO.
PROJECT 103105 D00 093 0076 0W
SHEET 1 OF SHEETS



NOTE:
. UNLESS OTHERWISE SPECIFIED:
a. WIRES TO BE #22 PHU.
b. COAX PER B00 916 0001 0.

RELEASED FOR PRODUCTION | ENGR | DATE
NO | REVISIONS | APP'D

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE ON: X = ± .03 XX = ± .02 XXX = ± .015 XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED
SCALE | USED ON | DWG. NO. WAS:
DRAWN | DATE | RCDR | DATE
CHKD | DATE | REVWD | DATE
DSGR | DATE | APPVD | DATE

EAI: ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

(TRUNK & ST, SP, & SP' HARNESSES (380)

SHT. NO.
SIZE
REV. NO.
PROJECT 103105
D00 093 00760W
SHEET OF SHEETS

RELEASED FOR PRODUCTION	ENGR	DATE

NO.	REVISIONS	APPV'D
1	16.1565 SECTION SL/ATO WAS SL/ATO SL/ATO-2 FUNC WAS - REF. WIRE WAS (WHT-VIO), DEST WAS BUS #20. SL/ATO-1 FUNC WAS - REF OUT (EXT) WIRE WAS (WHT VIO) 7 Jan 69 ERN 380-36-1	
2	CPJ7-3 TO SL/ATO-3 "HOLD" WAS CPJ7-6 TO SL/ATO-3 FUNCT "ST" 12 FEB 69 ERN 380-058-0	
3	SL/ATO-1 WIRE WAS WHT RED ADDED GRD CONN. 11 MAR 69 ERN 380-074-0	

ATJ2
8 P00
7 P01
6 P02
5 P03
3 SP
4 + REF
2 DIG GRD
12 ± GRD
11 ± GRD
10 ± GRD

ATJ4
8 P04
7 P05
6 P06
5 P07
3 SP
4 + REF
2 DIG GRD
12 ± GRD
11 ± GRD
10 ± GRD

ATJ6
8 P08
7 P09
6 P10
5 P11
3 SP
4 + REF
2 DIG GRD
12 ± GRD
11 ± GRD
10 ± GRD

ATJ8
8 P12
7 P13
6 P14
5 P15
3 SP
4 + REF
2 DIG GRD
12 ± GRD
11 ± GRD
10 ± GRD

ATJ10
8 P16
7 P17
6 P18
5 P19
3 SP
4 + REF
2 DIG GRD
12 ± GRD
11 ± GRD
10 ± GRD

NW1

BRN	5	
ORN	4	
GRN	6	
VIO	8	
GRN	6	BUS #1
WHT-RED	1	BUS #2
GY-BLK	5	BUS #2
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BRN	10	
ORN	9	
GRN	14	
VIO	13	
GRN	6	BUS #1
WHT-RED	1	BUS #2
GY-BLK	5	BUS #2
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BRN	17	
ORN	16	
GRN	21	
VIO	20	
GRN	6	BUS #1
WHT-RED	1	BUS #2
GY-BLK	5	BUS #2
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BRN	22	
ORN	24	
GRN	26	
VIO	25	
GRN	6	BUS #1
WHT-RED	1	BUS #2
GY-BLK	5	BUS #2
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4
BLK-ORN #20		BUS #4

BUS #1
6 GRN
1 WHT-RED
5 GY-BLK
GRN 6
WHT-RED 1
GY-BLK 5
6 GRN
1 WHT-RED
5 GY-BLK
GRN 6
WHT-RED 1
GY-BLK 5
6 GRN
1 WHT-RED
5 GY-BLK
GRN 6
WHT-RED 1
GY-BLK 5

BUS #2
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20

BUS #4
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20
BLK-ORN #20

NW2

5	VIO	P23
3	GRN	P22
1	ORN	P21
2	BRN	P20
10	VIO	P27
11	GRN	P26
6	ORN	P25
7	BRN	P24
17	VIO	P31
18	GRN	P30
13	ORN	P29
14	BRN	P28
22	VIO	P35
23	GRN	P34
21	ORN	P33
19	BRN	P32

ATJ12
SP 3
+ REF 4
DIG GRD 2
± GRD 10
± GRD 11
± GRD 12
5 VIO P23 5
3 GRN P22 6
1 ORN P21 7
2 BRN P20 8

ATJ14
SP 3
+ REF 4
DIG GRD 2
± GRD 10
± GRD 11
± GRD 12
10 VIO P27 5
11 GRN P26 6
6 ORN P25 7
7 BRN P24 8

ATJ16
SP 3
+ REF 4
DIG GRD 2
± GRD 10
± GRD 11
± GRD 12
17 VIO P31 5
18 GRN P30 6
13 ORN P29 7
14 BRN P28 8

ATJ18
SP 3
+ REF 4
DIG GRD 2
± GRD 10
± GRD 11
± GRD 12
22 VIO P35 5
23 GRN P34 6
21 ORN P33 7
19 BRN P32 8

CPJ9
3 GY
4 GRN-WHT
8 WHT
1 WHT-RED
BLK
BLK
7 RED
5 BRN
12 WHT
BLK
8 RED
6 BRN
6 SHD #20

CPJ11
-20V
+5V
TS
GRD a
GRD b
2MS (OUT)
1 SEL (OUT)
TS
+ REF OUT (EXT)

CPJ17
1
4
5
3
6
2
7
5

CPJ7
WHT-BLU 1
YEL 2
GRN 4
WHT-GRN 5
WHT 3

SL/ATO
PP 7
IC 18
OP 5
+ REF 2
SP 4
HOLD 3
± GRD 17
2MS IN 6
1 SEC IN 8
1 CHASSIS GRD LUG

0.18.1540
ATTENUATOR SELECT

CPP16
1 A
5 GRN
2 A
6 BLK

0.100.0371
JUMPER CONNECTOR (SEE NOTE 2)

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
a. WIRES TO BE #22 PHU.
2. REQUIRED WHEN LOGIC UNIT EXPANSION IS NOT USED.

FL1,2
2 +30V
3 ± GRD
4 +15V
6 -15V

FL3,4
2 +5V
3 DIG GRD
4 + REF
6 - REF

FL5,6

RED	4	
BLK	5	
ORN	3	
VIO	2	
GRN-WHT	4	
GY-BLK	5	
WHT-RED	1	
WHT-VIO	2	

2 +30V RED 4
3 ± GRD BLK 5
4 +15V ORN 3
6 -15V VIO 2

FILTER NETWORK

BUS #3

0.18.1565
SLAVE & TIME SCALE

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

(ATTEN. SELECT, SL. TIME SCALE & FILTER NETWORK) (380)

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: X = ±.03 .XX = ±.02 .XXX = ±.010 .XXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED

SCALE
DRAWN DATE
CHKD DATE
DSGR DATE
USED ON:
RCDR DATE
REVWD DATE
APPVD DATE
DWG. NO. WAR.
SHT. NO.
SIZE
REV. NO.
PROJECT 103105
D0009300760W
SHEET 8 OF SHEETS

EAI 999 3203-0 D & W BLUEPRINT CO. 88376-4

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
2. WIRES TO BE #22 PHU.
   b. COAX PER BOD 916 0001 0.

MDFG #1		GRD LUG #1	BUS #2	BUS #3	BUS #4	OV4	A31	CHASSIS GRD	A33	GRD LUG #2	MDFG #2	
2	± GRD (c)				BLK							
3	± GRD (d)				BLK-WHT							
13	SL GRD				BLK-ORN #20							
15	BRK PT GRD				BLK-RED							
30	BRK PT GRD				BLK-RED							
32	SLOPE-GRD				BLK-ORN #20							
38	± GRD (d)				BLK-WHT	U	BLK-RED				OVLD (32)	6
39	± GRD (c)				BLK	S	GRN				OVLD (33)	36
11	+ REF	WHT-RED	1		BLK						± GRD (c)	2
34	+ REF	WHT-RED			BLK-WHT						± GRD (d)	3
12	- REF	WHT-VIO	2		BLK-ORN #20						SL GRD	13
33	- REF	WHT-VIO			BLK-RED						BRK PT GRD	15
29	DIG GRD	GY-BLK	5		BLK-RED						BRK PT GRD	30
1	+15V			ORN 3	BLK-ORN #20						SL GRD	32
40	+15V			ORN	BLK-WHT						± GRD (d)	38
4	-15V			VIO 4	BLK						± GRD (c)	39
37	-15V			VIO								
6	OVLD (30)					BLK-RED	X					
36	OVLD (31)					GRN-RED	V					
8		OUTPUT					H		H	OUTPUT	BLK	8
21	BLK	GAIN 1 10 SEG					E		E	GAIN 1 10 SEG	BLK	21
22	BLK	INPUT 20 SEG					K		K	INPUT 20 SEG	BLK	22
23	BLK	INPUT 10 SEG					F		F	INPUT 10 SEG	BLK	23
24	BLK	GAIN 1 20 SEG					J		J	GAIN 1 20 SEG	BLK	24
35	BLK	OUTPUT					Y		Y	OUTPUT	BLK	35
	BLK		1	WHT-RED				BLK #16			+ REF	11
		WHT-RED		WHT-RED							+ REF	34
			2	WHT-VIO							- REF	12
		WHT-VIO		WHT-VIO							- REF	33
			5	GY-BLK							DIG GRD	29
			3	ORN							+15V	1
				ORN							+15V	40
			2	VIO							-15V	4
				VIO							-15V	37

0.18.1535
MDFG RACK

TB1	TB2	PS1	CPJ13	F2	F1	AC3	AC2	AC1
3 GY			-20V 5				WHT #18 2	P AC COM 2
5 GY-BLK			DIG GRD 6					AC HOT 1
4 WHT #18	AC COM	P 15	2 WHT-GY #18	1 BUS #1B	1 WHT-GY #18	AC HOT (SW) 1		
3 WHT GY #18	AC HOT	32	1 WHT-GY #18		AC HOT 2			
2 WHT #18	AC COM	P 31	3 WHT #18	2 WHT-GY #18		AC HOT		
WHT #18		P 1				(IN) AC COM 2		
1 WHT-GY #18	AC HOT	16		GRN #18		CHAS GRD 3		
WHT-GY #18		2				AC HOT (SW) 1		
1 WHT-GY #18						AC COM 2		
4 WHT #18				GRN #18			CHAS GRD	3
4 WHT #18			AC COM (SW) 4					
3 GRN #18			CHAS GRD	GRN #18			CHAS GRD	3

0.18.1546
A.C. RACK

RELEASED FOR PRODUCTION	ENGR	DATE
NO	REVISIONS	APPVD
1	F2-1 DEST F1-1 WAS F2-1 DEST F1-2, WIRE WAS WHT-GY. 9.25 FEB 69 ERN 380-053-1	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

(MDFG & AC HARNESSES)
(380)

MATERIAL:
FINISH:
DWG. NO. WAS:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .010 .XXX = ± .005 ∠ = ± 1°
*TOL. OF MATERIAL SUPPLIED
SCALE
USED ON:
DRAWN DATE CKD DATE DSGR DATE
RCDS DATE REVWD DATE APPVD DATE

SHT. NO.
SIZE
REV. NO.
PROJECT 103105 D00093 0076 0W
SHEET 9 OF SHEETS

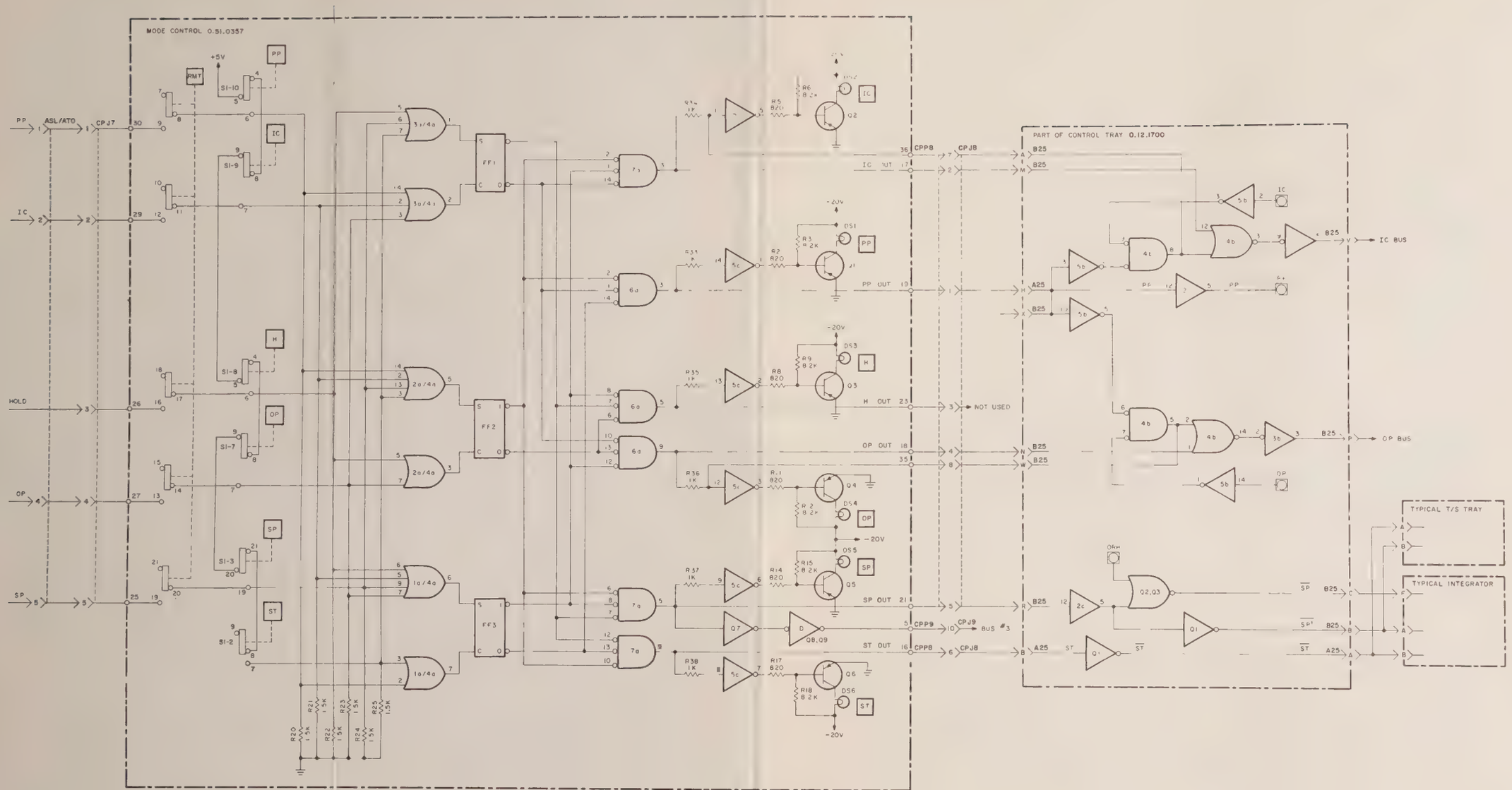


Figure 3.4.
Analog Mode Selection System,
Simplified Schematic

The static test (ST) signal is inverted by Q1 in the control tray and is applied as an $\overline{ST}$ signal to the integrator and track/store trays.

The $\overline{SP'}$ output used in the integrator and track/store trays is generated by applying the SP signal through Buffer 2C and Inverter Q1. The $\overline{SP}$ signal used in the integrator is generated by applying the output of Buffer 2C to the OR gate comprised of Transistors Q2 and Q3. The second input to the OR gate is applied through the override hold (ORH), patch terminal on the control tray. A high at either input to the OR gate forces its output and the $\overline{SP}$ line low.

Since the OP and IC circuits in the control tray are identical in operation, only the IC circuit is described. When the IC output from the mode control unit goes high the output of OR Gate 4b (Pin 3) is forced low. The low is then applied to the input of Inverter 3b. The high output from the inverter drives the IC bus. Control of the IC and OP modes from patching terminals on the control tray is possible if the PP mode on the analog control panel is selected. The high PP output from the mode control tray is inverted by 5b and applied as a low to Pin 10 of AND Gate 4b. A logic high patched to the IC input is also inverted by another section of 5b and a low is also applied to Pin 9 of AND gate 4b. The two lows on the input of this gate force its output to go high. The output of the AND gate (Pin 8) is connected to the lamp circuit and the input (Pin 13) of OR Gate 4b. The high level at this point turns the IC lamp on and forces the output of OR Gate 4b to go low. Inverter 3b inverts the low output from the OR gate and drives the IC bus.

3.4.2 Time Scale

The time scale circuit is used to change the time constant of the integrators by a factor of 500. Figure 3.5 is a simplified schematic showing the major components of the time scale circuit. Refer to this schematic for the following description.

For purposes of description, assume that the time scale signal is to be generated from the analog panel. Depending on the position of the RMT switch, the time scale signal may be generated by pressing either the N or F pushbutton, or by an external device. Assume that the time scale signal is being generated internally for the following description.

When the N pushbutton is depressed, the set input of the flip-flop, located on the 0.51.0437 Time Scale Card, goes high, the 1 output of the flip-flop goes low and the 0 output goes high. The low at the 1 output is inverted by Q3 and Bus 2 goes high. The high from the 0 output of the flip-flop is inverted, essentially grounding the base of Q2 through R11, the base goes negative and the transistor conducts causing the N lamp to light.

3.4.3 Analog Timer

The analog timer circuit (Figure 3.6) provides a means of generating precise time intervals. The intervals generated have time durations determined by the timer switches, and the multiplier pushbuttons located on the analog panel, 0.20.1235. The time intervals established by these controls may be used to control the analog modes of the computer for iterative or repetative operation.

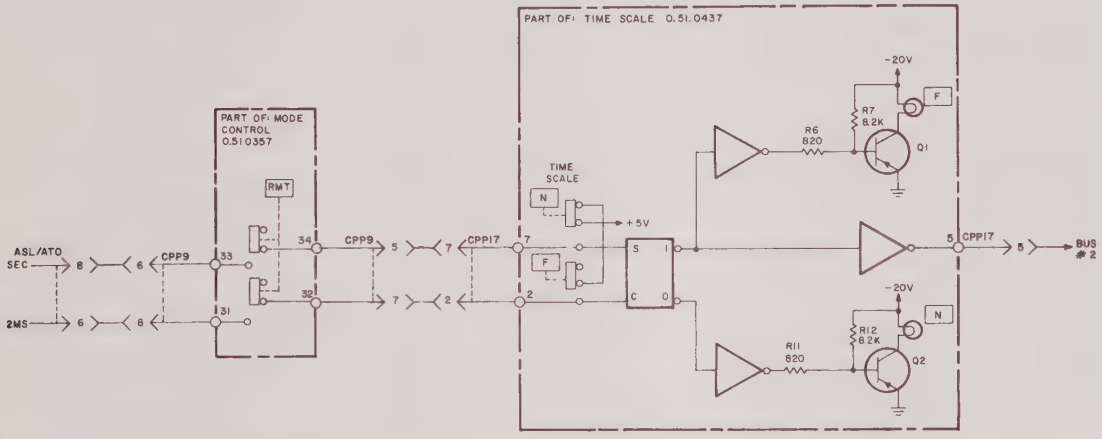


Figure 3.5. Analog Time Scale (Simplified Schematic)

A voltage is picked off of the switches at the wiper and is fed through Limitron RT1, RT2 and Field Effect Transistors (FET), Q2 or Q9 to the input of the integrators. The integrator rate is determined by the feedback capacitors (C1 through C5) which are selected by the .1 s, 10 ms, 1 ms pushbuttons shown at the upper right of Figure 3.6.

Prior to operating the analog timer, it is necessary to patch a high to the RUN terminal on the control tray or to activate the PP pushbutton on the analog control panel. If neither the RUN or PP inputs are high, the input and output of emitter follower Q14 are low. The inverter in series with Q14 has a high output and forward biases Q7 which is connected as a diode. The high at the collector of Q7 also forward biases CR6 and CR7 connecting a positive voltage to the base of Transistors Q3 and Q4. With the base of Q3 and Q4 negative, the transistors conduct and the gates of FET Q2 and Q9 are negative, pinching off the FET's. The negative voltage at the gate of each FET also serves to saturate CR3 and CR4, grounding the IC and OP input lines. The high at the emitter of Q7 is also applied to the inverter in series with Q13. The low output of the inverter back biases Q13 (connected as a diode) and its output is at zero volt. The base of Q12 is more positive than the emitter (-6 volts), the transistor conducts, pinching off FET Q10 and saturates Transistor Q11. With this circuit configuration, the integrator input is grounded and the feedback capacitors are replaced by a 10k feedback resistor (R22).

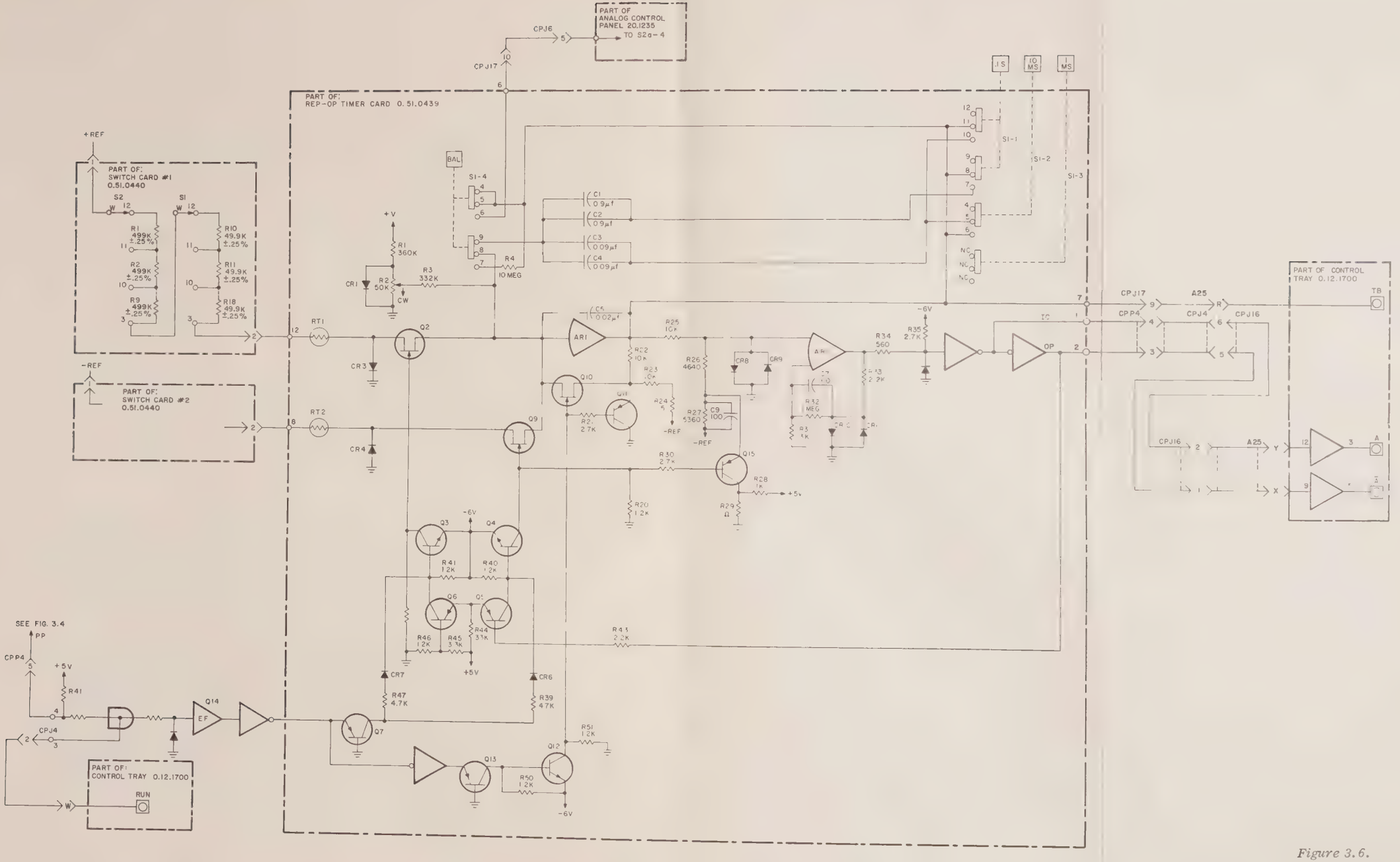


Figure 3.6.
Analog Timer
Simplified Schematic

When the RUN and PP lines are high, the feedback resistor is removed from the integrator and the IC and OP FET's are controlled by internal circuitry as described below.

In the OP mode, reference is applied through FET Q9 to the integrator input. The output of the integrator (positive current) is applied to the input of Amplifier AR1. Negative current is also applied to the amplifier input from -Ref through Resistors R26 and R27. When the integrator output current nulls with the negative current (approximately 1 ma) the output of Amplifier AR1 goes low, and the OP line applies a low to Pin 2 of the rep-op timer card. The low at Pin 2 is buffered and the $\overline{A}$ patch terminal on the control tray is low. With the AR1 output low, the IC line, which is complementary to the OP line, goes high (patch Terminal A on the control tray is high). The low OP signal turns on Transistor Q5, its collector goes positive turning on Q4. When Q4 is saturated, its collector goes negative, pinching off the OP FET Q9 and grounds the FET input by saturating CR9. The negative voltage used to pinch off FET Q9 is also applied to the base of Q15, turning the transistor on and grounding the reference through R27 and R29.

When the OP line goes low and Transistor Q5 conducts, the emitter of Q6 becomes less positive than its base and cuts off. With the drive voltage removed from Q3 it is in turn cut off, the gate of the IC FET (Q2) is biased positive and conducts, putting the integrator in the IC mode. The 0 volts on the gate of the FET back biases CR3 and the IC input line is lifted off ground.

In the IC mode, the integrator feedback capacitors charge to a point that the comparator output again changes state and goes high. The output of AR1 (TB on control tray) is inverted and the IC line goes low (Patch Terminal A on the control tray goes low). The low on the OP line cuts off Q5 which in turn cuts off Q4 removing the negative voltage from the gate of Q9. FET Q9 is turned on by a slight positive bias, CR9 and Q15 are turned off. When Q5 is cut off, Q6 and Q3 conduct and the IC FET (Q2) is pinched off and CR3 conducts grounding the IC input signal.

3.4.3.1 *Rep-Op Amplifier (AR1).* See Figure 3.7 for the following description. The output of Amplifier AR1 is connected to a level shifter consisting of NPN Transistor Q1 and Resistors R2 and R5. This allows the output voltage of Amplifier AR1 to be nominally zero while driving a gain stage including Transistor Q2 with an emitter voltage close to +15 volts. The level shifter operates as follows: R2 and R5 are chosen of equal value to give unity voltage gain and as Q1 is connected in the common base configuration, the emitter current of Q1 is equal to its collector current. This results in the junction of the emitter of Q1 and R5 being held at 13.5 volts. As the output voltage of Amplifier AR1 changes, a corresponding change will occur in the 13.5 volt signal at the emitter of Transistor Q1.

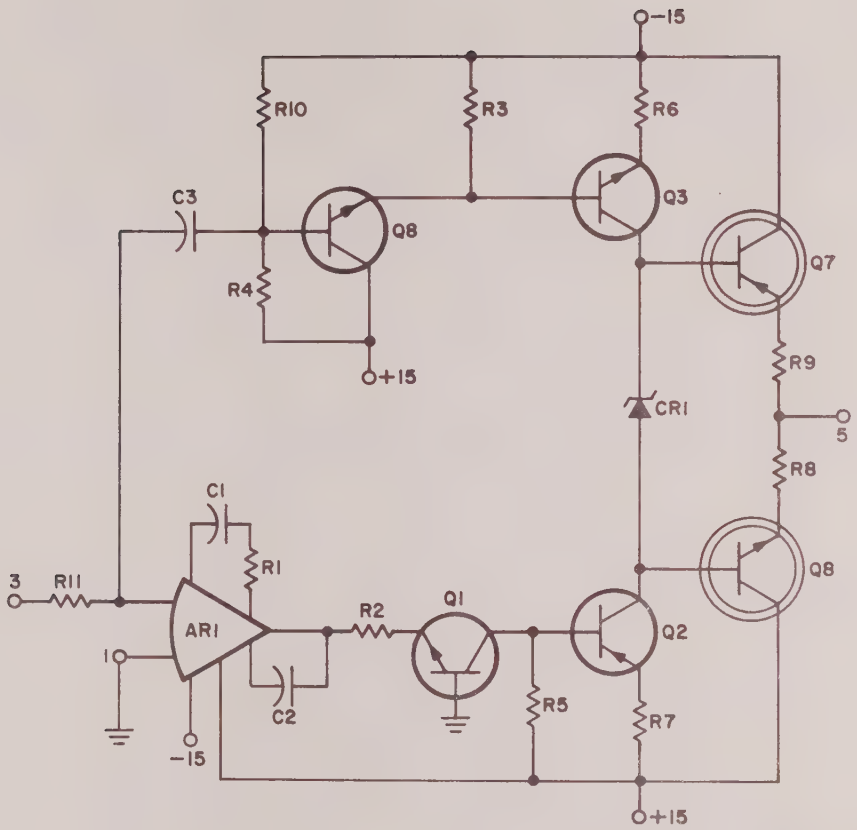


Figure 3.7. Rep-Op Timer Amplifier, Simplified Schematic

Transistors Q2 and Q3 are connected in the common emitter configuration, thus resulting in high voltage gain with 180° phase inversion. At low frequency (i.e., frequencies below the corner frequency of the high pass filter formed by C3 and R10), Transistor Q3 functions as a constant current source for Transistor Q2.

The high frequency channel is connected to Terminal 3. This channel includes a high pass filter comprised of Capacitor C3 and Resistors R4 and R10. The output of the filter is connected to the base of NPN Transistor Q8. The emitter of Transistor Q8 is connected to the base of another NPN Transistor Q3. Bias for this channel is provided from a +15 volt source at the collector of Q8 and a -15 volt source at the emitter of Q3. Resistor R3 serves as the load for Transistor Q8 while R6 determines the collector current of Transistor Q3. The collectors of Transistors Q3 and Q2 are coupled via a Stabistor CR1.

At low frequencies, the input signal at Terminal 3 is blocked by the high pass filter. Transistors Q3 and Q8 are biased ON and are functioning in a static mode. Transistor Q3 thus serves as a constant current source for Transistor Q2. The load for Transistor Q2 is the output impedance of Transistor Q3. This results in high voltage gain in Transistor Q2.

The collectors of Transistors Q2 and Q3 are connected to an output circuit consisting of Transistors Q6 and Q7 connected in the common collector configuration and Resistors R8, R9, R12 and R13. Transistors Q7 and Q8 are of opposite conductivity types for providing current amplification on the positive and negative swings of their input signal.

Stabistor CR1 eliminates the cross-over distortion which occurs when one of the output transistors (Q7 or Q8) turns on and the other turns off. More particularly, as Transistor Q3 serves as current source for Transistor Q2, a voltage drop is established across the stabistor which biases Transistors Q6 and Q7 in an on quiescent condition.

The actual 0.51.0439 schematic shows three additional transistors (Q4, Q6, Q8) which are used for current protection.

3.4.3.2 *Amplifier Balance.* Balancing the Rep-Op Amplifier may be done in any mode and is accomplished as follows:

1. Place the VM FUNCTION switch to SBAL.
2. Depress the BAL pushbutton switch on the 0.20.1235 Analog Control Panel and adjust R2 (0.51.0439), located adjacent to BAL, with a screw driver for a zero reading on the meter.

3.4.4 Control Tray, Model 0.12.1700

The 0.12.1700 Control Tray contains control circuits used with the mode control operation of the 380 Computer and control circuits for peripheral equipment. The following paragraphs contain the theory of operation for those control circuits associated with peripheral equipment. The circuits associated with the mode control of the computer are described in Paragraph 3.4.1.

3.4.4.1 *Pen Control Circuit (DN).* The pen control circuit consists of a jumper from the DN patch terminal to Pin N of Connector B25 (P2). Cabling from that point connects the logic control signal to the pen down circuit located in the plotter. A high (+5 volts) causes the pen to be lowered to the plotting surface while a low (0 volt) causes the pen to remain in the up position. For a description of the pen down circuit see the handbook accompanying the plotting board.

3.4.4.2 *Blanking Circuit.* The blanking circuit consisting of an inverter, Q5, and an emitter-follower, Q6, is used to blank the Rep-Op Scope when the IC or the Z patch terminals go high. Refer to Figure 3.8 and Schematic D00 012 1616 0S for the following description.

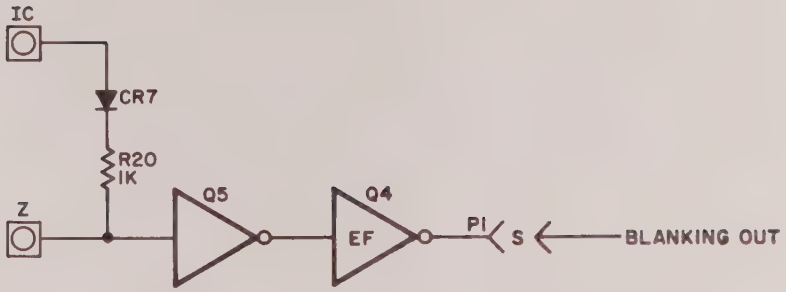


Figure 3.8. Blanking Circuit

If the signal at either the IC or Z terminal goes high the output of Q5 is low and the output of the emitter-follower is low (-15 volts). This output is connected through the scope connector on the 380 computer to the blanking circuits in the Rep-Op Display Unit.

3.4.4.3 *MDFG Set-Up Circuitry.* This circuit is used to set-up functions on the manual diode function generators. An external amplifier (0.6.0614-2 or 0.6.0704-3) is patched to AJ and O on the 12.1700 Control Tray. The computer may be in any mode *except* Set Pot during the MDFG set-up. A detailed explanation of the MDFG and the set-up circuitry is given in the 380 Computing Components Manual (EAI Publication Number 00 800.2066-0).

3.4.4.4 *Trunk Circuits.* Many of the patch terminations on the control tray are used to give convenient inputs or output to readout devices or circuits not otherwise terminated on the patch panel. The trunk circuits, which consist of straight-through wiring, and the associated patching terminations are described in the sections or manuals dealing with their function. Figure 3.9 shows the patch terminals and their ultimate destinations. The group of trunks, designated T2, are input trunks. These trunks, designated A30 through A39, are read out through the select system.

3.5 MAINTENANCE AND TROUBLESHOOTING

3.5.1 Maintenance

The mode control components require no routine maintenance or adjustments.

3.5.2 Troubleshooting

The problems that may develop in the mode control circuits are usually due to the failure of a diode, transistor, or an integrated circuit element; rarely due to the failure of a resistor, capacitor or other passive component. Often, a problem can be isolated to a single component

or group of components simply by depressing the mode selection pushbuttons and observing the symptoms, then referring to Figures 3.4 through 3.8. If the problem is more difficult to isolate, a direct-coupled oscilloscope may be used to check point-to-point waveforms or voltage levels.

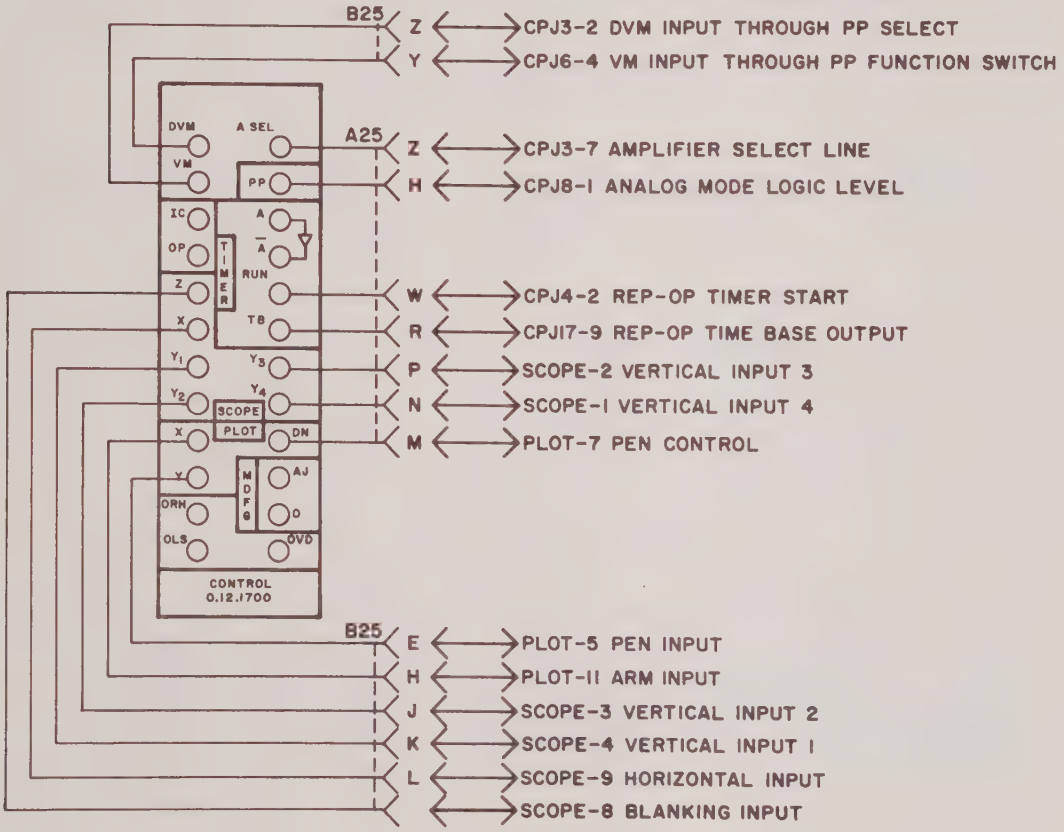


Figure 3.9. Trunk Wiring on Control Tray

The 0.12.1700 Control Tray may be installed on a service shelf (EAI Part Number 0.51.0382) to perform these checks.

Several points that may be useful in evaluating symptoms are summarized below:

1. The lights beneath the keyboard registers are driven from the outputs of the mode or time scale registers. If the correct pushbutton for a selected mode is illuminated, it can be assumed that this register is functioning properly.

2. If the analog mode registers appear to be operating properly, but none of the integrators respond to the mode selection, the trouble is probably in the 0.12.1616 Control Card located in the 0.12.1700 Control Tray. Select the PP mode (analog) and patch an input to the IC terminal. The integrators should be in the IC mode when this terminal is high. Similarly the integrators should be in the operate mode when the OP terminal is high. Refer to Figure 3.4 to determine the components that could cause the symptoms observed.

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.20.1235-0 Analog Control Panel	3-19
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0.51.0439-0 Rep-Op Timer	3-20
0.51.0440-0 Switch Card	3-24
0.51.0357-2 Mode Control Card	3-25
0.51.0372-2 Comparator and Function Relay Control	3-27
0.12.1636 Comparator and Function Relay Control Card	3-27
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0.12.1616 Control Card 2	3-31
0.12.1722 Control Card 1	3-32

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	AC	Switch, Push-Push: Normally Open (Centralab J51357 or equal)	00 656.0223-0	A
2	CPP13	Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
3	M1	Meter: 50-0-50	00 590.0055-1	B
4	S1	Switch, Rotary: 3 Sections, 1 Pole per Section; 2-12 Positions, Non-Shorting (Centralab PA2009 or equal)	00 658.0011-0	A
5	S2	Switch, Rotary: 2 Sections, 1 Pole per Section; 2-12 Positions, Non-Shorting (Centralab PA2005 or equal)	00 658.0007-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

ANALOG CONTROL PANEL

MODEL NO.

0.20.1235-0 Sh.1 of 1 Sh.

0

DATE 12/19/68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	0a	Integrated Circuitry: Quad 2-Input Gate	00 592.0096-0	B
2	AR1	Integrated Circuitry: Operational Amplifier	00 592.0153-0	B
3	AR2	Integrated Circuitry: Amplifier	00 592.0059-0	B
4	C1,2	Capacitor: Matched Pair	00 525.0020-0	B
5	C3,4	Capacitor: Matched Pair	00 525.0019-0	B
6	C5	Capacitor	00 521.0146-0	B
7	C6	Capacitor, Fixed, Film: 0.001 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.1102-1	A
8	C7	Capacitor, Fixed, Film: 0.047 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.2473-1	A
9	C8	Capacitor, Fixed, Film: 0.0022 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.1222-1	A
10	C9,10,11	Capacitor, Fixed, Ceramic: 100 pf ±5%, 200V (Erie Type 835 or equal)	00 511.1101-2	A
11	C12,13,14, 16,17	Capacitor, Fixed, Electrolytic: 15 uf ±20%, 20V (Sprague Type 150D or equal)	00 517.1156-3	A
12	C15	Capacitor, Fixed, Film: 0.01 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.1103-1	A
13	CR1	Diode	00 614.0199-0	B
14	CR2	Stabistor	00 648.0004-0	B
15	CR3,9,12	Diode: 1N4002	00 614.0110-0	A
16	CR4 thru 8	Diode: 1N916	00 614.0148-0	A
17	CR10,11	Diode	00 614.0293-0	B
18	CR13	Diode: 1N4730A	00 615.2399-0	A

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UNIT TITLE

REP-OP TIMER

MODEL NO.

0.51.0439-0 Sh.1 of 4 Sh.

1

DATE 12 / 19 / 68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
19	CR14	Diode: 1N4735A	00 615.2629-0	A
20	CR15,16	Diode	00 614.0007-0	B
21	L1,2	Choke: Shielding Bead (Ferroxcube 56590 65/4B or equal)	00 538.0030-0	A
22	Q1,2,5,8	Transistor	00 686.0330-0	B
23	Q3	Transistor	00 686.0242-0	B
24	Q4,6,7	Transistor	00 686.0331-0	B
25	Q9	Transistor	00 686.0107-0	B
26	Q10	Transistor	00 686.0270-0	B
27	Q11,12,13	Transistor	00 686.0245-0	B
28	Q14,17,18, 20,21	Transistor	00 686.0258-0	B
29	Q15,16, 19,22	Transistor: 2N3646	00 686.0230-0	B
30	R1	Resistor, Fixed, Composition: 360K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0364-0	A
31	R2	Potentiometer: 50K ohms ±10%, 3/4W (Helipot Type 77P or equal)	00 643.1503-5	A
32	R3	Resistor, Fixed, Film: 332K ohms ±0.1%, 1/4W ±70°C (Int. Resistance Corp. CEA or equal)	00 632.3323-8	A
33	R4	Resistor, Fixed, Composition: 10 megohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0106-0	A
34	R5	Resistor, Fixed, Composition: 100K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0104-0	A
35	R6	Resistor, Fixed, Composition: 910K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0914-0	A

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A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 2 / 11 / 69

UNIT TITLE

REP-OP TIMER

MODEL NO.

0.51.0439-0 Sh. 2 of 4 Sh.

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
36	R7	Resistor, Fixed, Composition: 13K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0133-0	A
37	R8	Resistor, Fixed, Composition: 330 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0331-0	A
38	R9	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
39	R10,11	Resistor, Fixed, Composition: 3.9K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0392-0	A
40	R12	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
41	R13	Resistor, Fixed, Composition: 240 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0241-0	A
42	R14,15	Resistor, Fixed, Composition: 11 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0110-0	A
43	R16,17,30	Resistor, Fixed, Film: 10K ohms ±0.1%, 1/4W @70°C (Int. Resistance CEA or equal)	00 632.1002-8	A
44	R18	Resistor, Fixed, Film: 4640 ohms ±0.1%, 1/4W @70°C (Int. Resistance CEA or equal)	00 632.4641-8	A
45	R19	Resistor, Fixed, Film: 5360 ohms ±0.1%, 1/4W @70°C (Int. Resistance CEA or equal)	00 632.5361-8	A
46	R20,27, 29,47	Resistor, Fixed, Composition: 2.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0272-0	A
47	R21,42,43	Resistor, Fixed, Composition: 1K ohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
48	R22	Resistor, Fixed, Composition: 1 ohm ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0109-0	A

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UNIT TITLE

REP-OP TIMER

MODEL NO.

0.51.0439-0 Sh. 3 of 4 Sh.

DATE 2 / 11 / 69

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
49	R23	Resistor, Fixed, Composition: 3K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0302-0	A
50	R24	Resistor, Fixed, Composition: 1 megohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0105-0	A
51	R51	Resistor, Fixed, Composition: 10K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0103-0	A
52	R25	Resistor, Fixed, Composition: 560 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0561-0	A
53	R26,36,44	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0222-0	A
54	R28,32,33, 34,39,48,49	Resistor, Fixed, Composition: 1.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0122-0	A
55	R31	Resistor, Fixed, Composition: 15 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0150-0	A
56	R35,40	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
57	R37,38	Resistor, Fixed, Composition: 3.3K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0332-0	A
58	R41	Resistor, Fixed, Composition: 510 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0511-0	A
59	R45,46	Resistor, Fixed, Composition: 470 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0471-0	A
60	R50	Resistor, Fixed, Composition: 470 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0471-0	A
61	RT1,2	Resistor: Non-Linear	00 646.0062-0	B
62	S1	Switch	00 656.0221-0	B

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DATE 2 / 11 / 69

UNIT TITLE

REP-OP TIMER

MODEL NO.

0.51.0439-0 Sh. 4 of 4 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	R1 thru 9	Resistor, Fixed, Film: 499K ohms ±0.25%, 1/4W @70°C (Int. Resistance Corp. Type CEA or equal)	00 632.4993-6	A
2	R10 thru 18	Resistor, Fixed, Film: 49.9K ohms ±0.25%, 1/4W @70°C (Int. Resistance Corp. Type CEA or equal)	00 632.4992-6	A
3	S1,2	Switch	00 658.0278-0	B

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UNIT TITLE

SWITCH CARD

MODEL NO.

0.51.0440-0 Sh. 1 of 1 Sh.

0 DATE 12/ 19 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1a,2a,3a	Integrated Circuitry: Dual 4-Input Gate	00 592.0095-0	B
2	4a,5c	Integrated Circuitry: Hex Inverter	00 592.0100-0	B
3	5a,5b	Integrated Circuitry: Quad 2-Input Gate	00 592.0096-0	B
4	6a,7a	Integrated Circuitry: Triple 3-Input Gate	00 592.0098-0	B
5	C1,3	Capacitor	00 516.0387-0	B
6	C2,4	Capacitor, Fixed, Ceramic: 10 nf +60%, -40%, 150V (Centralab DDM-103 or equal)	00 515.0151-0	A
7	C5	Capacitor, Fixed, Ceramic: 0.47 nf ±20%, 25V (Sprague Type 3C or equal)	00 511.5473-4	A
8	P7,8,9	Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
9	Q1 thru 8	Transistor: 2N3638A	00 686.0305-0	A
10	Q9	Transistor	00 686.0381-0	B
11	R2,5,8,11, 14,17,43	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
12	R3,6,9,12, 15,18	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0822-0	A
13	R4,7,10,13, 16,19,41,42	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
14	R20 thru 25,27 thru 32,39	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
15	R26,44	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A

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B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

MODE CONTROL CARD

MODEL NO.

0.51.0357-2 Sh. 1 of 2 Sh.

5

DATE 12/ 19 /68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
16	R33 thru 38	Resistor, Fixed, Composition: 1K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
17	R40	Resistor, Fixed, Composition: 18K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0183-0	A
18	S1	Switch	00 656.0178-3	B
19		Lamp, Incandescent: 28V, 40 mA, Clear T-1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A

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DATE 12 / 19 /68

UNIT TITLE

MODE CONTROL CARD

MODEL NO.

0.51.0357-2 Sh. 2 of 2 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1		Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
		0.12.1636 COMPARATOR AND FUNCTION RELAY CONTROL CARD		
1	C1	Capacitor	00 516.0387-0	B
2	C2	Capacitor, Fixed, Electrolytic: 3.3 uf ±20%, 15V (Sprague 150D or equal)	00 516.0254-0	A
3	DS1-()	Lamp, Incandescent: 28V, 40 mA, Clear T-1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A
4	INV-1	Integrated Circuitry: Hex Inverter	00 592.0100-0	B
5	Q1-()	Transistor: 2N3687	00 686.0250-0	A
6	R1-(),5-()	Resistor, Fixed, Composition: 220 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0221-0	A
7	R2-()	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0822-0	A
8	R3-()	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
9	R4-()	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
10		Switch, Pushbutton	00 656.0178-1	B

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A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
COMPARATOR AND FUNCTION RELAY CONTROL

MODEL NO.
0.51.0372-2 Sh.1 of 1 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	Oa	Integrated Circuitry: Quad 2-Input Gate	00 592.0096-0	B
2	C1,3	Capacitor, Fixed, Electrolytic: 6.8 uf ±20%, 25V (Sprague Type 150D or equal)	00 517.1685-4	A
3	C2,4	Capacitor, Fixed, Ceramic: 0.01 uf ±20%, 200V (Erie Type 8131 or equal)	00 511.4103-4	A
4	C5	Capacitor, Fixed, Ceramic: 0.1 uf ±20%, 25V (Sprague 3C or equal)	00 511.5104-4	A
5	DS1,2	Lamp, Incandescent: 28V, 40 mA Clear T-1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A
6	Q1	Transistor: 2N3569	00 686.0229-0	A
7	Q2,3	Transistor	00 686.0241-0	B
8	R1	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
9	R2,3,9,10	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
10	R4	Resistor, Fixed, Composition: 470 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0471-0	A
11	R5	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
12	R6,11	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
13	R7,12	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0822-0	A
14	R8,13	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
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UNIT TITLE

TIME SCALE CARD

MODEL NO.

0.51.0437-1 Sh.1 of 2 Sh.

0

DATE 12 / 19 /68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
15	S1	Switch	00 656.0180-0	B
16		Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
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DATE 12 / 19 / 68

UNIT TITLE

TIME SCALE CARD

MODEL NO.

0.51.0437-1 Sh. 2 of 2 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	J1	Connector Block	00 542.1603-0	B
2	R1,2	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
3		Connector Block	00 542.1595-4	B

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UNIT TITLE

CONTROL TRAY

MODEL NO.

0.12.1700 Sh. 1 of 1 Sh.

0 DATE 12/ 19 /68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1a,2c,3b	Integrated Circuitry: Dual Buffer	00 592.0090-0	B
2	4b	Integrated Circuitry: Quad 2-Input Gate	00 592.0096-0	B
3	5b	Integrated Circuitry: Hex Inverter	00 592.0100-0	B
4	C1	Capacitor, Fixed, Ceramic: 10 nf +60% -40%, 150V (Centralab DDM-103 or equal)	00 515.0151-0	A
5	CR1 thru 7	Diode	00 614.0293-0	B
6	CR10	Stabistor	00 648.0004-0	B
7	Q1,2,3	Transistor	00 686.0229-0	B
8	Q4	Transistor: 2N3638	00 686.0250-0	A
9	Q5	Transistor: 2N3644	00 686.0325-0	A
10	R1,2,10, 11,12	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
11	R4,7,8,15, 18,21,22, 23,24	Resistor,Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
12	R5,6	Resistor, Fixed, Composition: 390 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0391-0	A
13	R9,14,20	Resistor, Fixed, Composition: 1K ohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
14	R13	Resistor, Fixed, Composition: 27K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0273-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

CONTROL CARD #2

MODEL NO.

0.12.1616 Sh. 1 of 1 Sh.

4 DATE 12 / 19 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	1a,1b	Integrated Circuitry: Dual Buffer	00 592.0087-0	B
2	C1,4,5	Capacitor, Fixed, Electrolytic: 22 uf ±20%, 15V (Sprague Type 150D or equal)	00 517.1226-2	A
3	C2	Capacitor	00 521.0077-0	B
4	C3	Capacitor, Fixed, Film: 0.1 uf ±5%, 200V (Sprague Type 192P or equal)	00 522.2104-0	A
5	CR1	Diode: 1N4002	00 614.0110-0	A
6	CR2	Diode°	00 614.0007-0	B
7	CR3,6,7,8	Diode: 1N4004	00 614.0209-0	A
8	CR4,5	Diode	00 614.0293-0	B
9	CR9,10	Diode: 1N4742A	00 615.2120-0	A
10	K1	Relay: 12V; 4 Form C Contacts (Allied Control T-154-4C-185 or equal)	00 618.0094-0	A
11	P1	Connector, Plug: 22 Position (Amphenol 133-022-43 or equal)	00 542.0488-0	A
12	Q1	Transistor	00 686.0229-0	B
13	Q2	Transistor	00 686.0325-0	B
14	R1	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
15	R2	Resistor, Fixed, Composition: 5.6K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0562-0	A
16	R3	Resistor, Fixed, Composition: 33 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0330-0	A
17	R4	Resistor, Fixed, Composition: 1.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0122-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

CONTROL CARD #1

MODEL NO.

0.12.1722 Sh.1 of 2 Sh.

0 DATE 12 / 19 /68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
18	R6	Resistor, Fixed, Composition: 3.9K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0392-0	A
19	R7,8,10, 11,12	Resistor, Fixed, Composition: 100 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0101-0	A
20	R9	Resistor, Fixed,Composition: 1K ohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

CONTROL CARD #1

MODEL NO.

0.12.1722 Sh. 2 of 2 Sh.

0

DATE 12/19/68

M446

APPENDIX 2

DRAWINGS

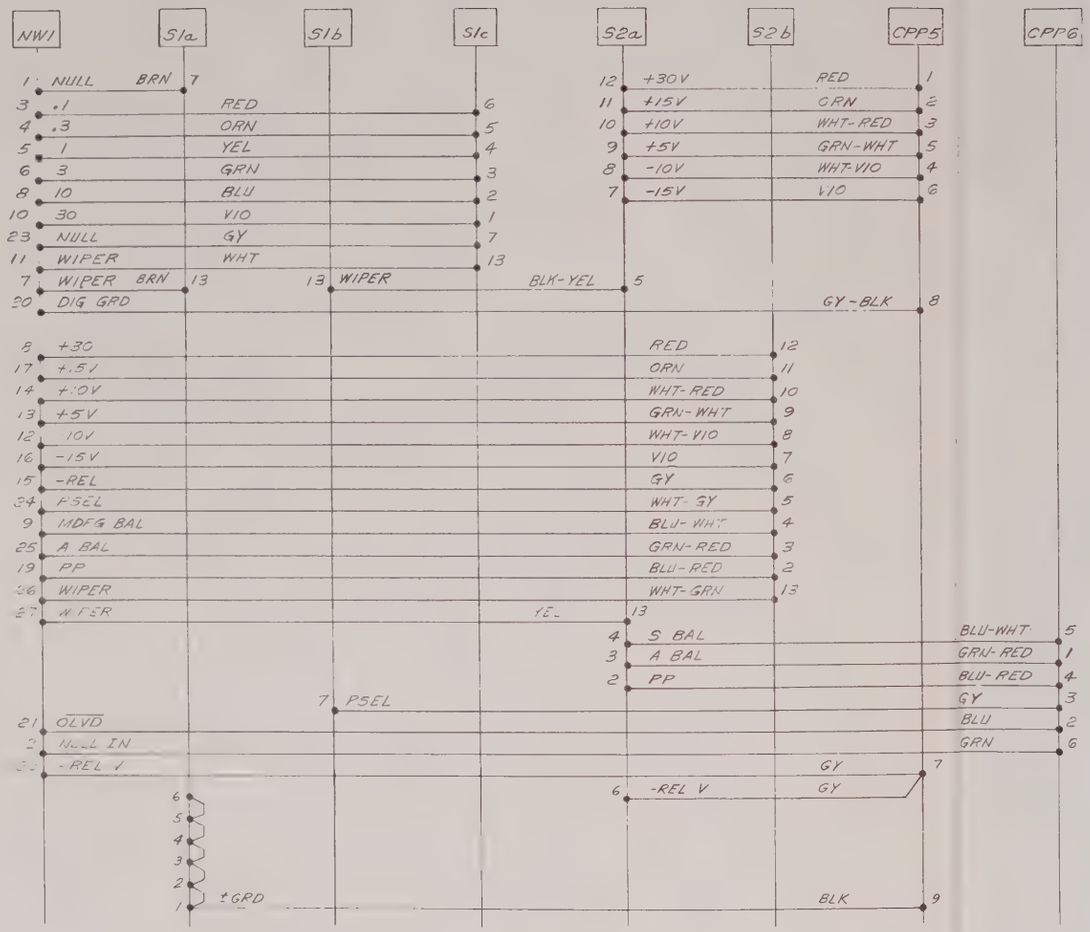
This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

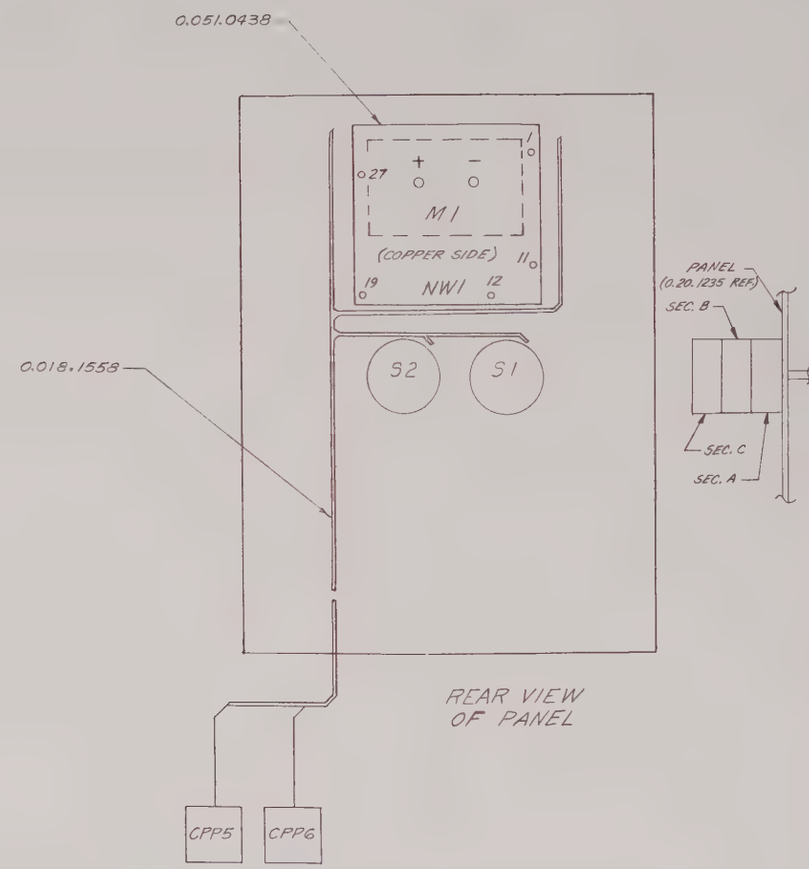
EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

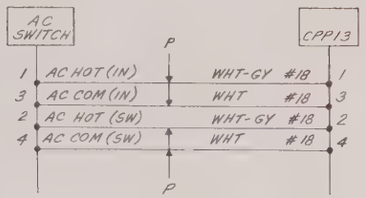
INDEX

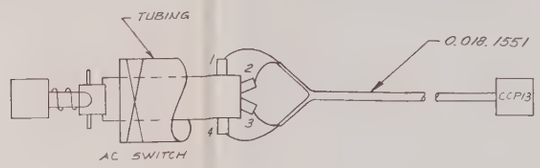
Unit or Component	Type of Drawing	Drawing Number
0.20.1235 Analog Panel	Wiring	D00 020 1235 0W (Sheets 1, 4, 5)
0.12.1700 Control Tray	Assembly W/Wiring	D00 012 1700 0A
0.12.1722 Card 1	Schematic	C00 012 1722 0S
0.12.1616 Card 2	Schematic	C00 012 1616 0S
0.2.1395 Rep-Op Expansion	Wiring	C00 002 1395 0W
0.51.0439 Rep-Op Timer	Schematic	D00 051 0439 0S
0.51.0357 Mode Control	Schematic	D00 051 0357 0S
0.51.0437 Time Scale	Schematic	C00 051 0437 0S

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
(a) WIRES ARE #22 TWH.









RELEASED FOR PRODUCTION:	ENGR	DATE
	C.H.	7 NOV 68

NO.	REVISIONS	APP'D
L1	SHT. 5 WAS NOT SPEC: 15 OCT 68 PPC.	
1	IN AREA E-1 & E-2: ADDED GRAY VINYL TUBING AROUND 0.018.1551 HARNESS SWITCH 9APR69ERN380-091-0	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

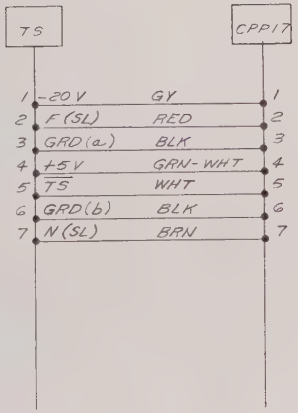
WIRING
ANALOG CONTROL PANEL

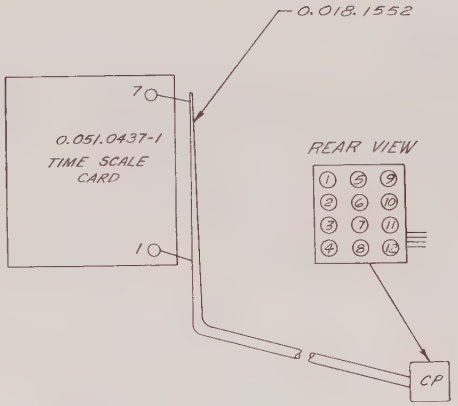
MATERIAL: SEE PARTS LIST A00 020 1235 OP
FINISH:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .XX ± .03 .XX ± .02 .XXX ± .010 .XXX ± .005 ∠ ± 1°
* TOL OF MATERIAL SUPPLIED

SCALE		DWG. NO. WAS:		SHT. NO.	2 3 4 5
		USED ON: A00 020 1235 OP		SIZE	C C C C
DRAWN C. BRUNO	DATE 23 SEPT 68	ACCD V. RENALS	DATE 5 NOV 68	REV. NO.	0 0 0 0
CHKD J.L. Hu 11	DATE 1 NOV 68	REVD H. Cassidy	DATE 5 Nov 68	PROJECT	103105
DSGR F.R. Ore W. Mather	DATE 28 SEPT 68	APP'D A. Novotny	DATE 7 Nov 68		D00 020 1235 OW

SHEET 1 OF 5 SHEETS

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
a. WIRES ARE #22 AWG.



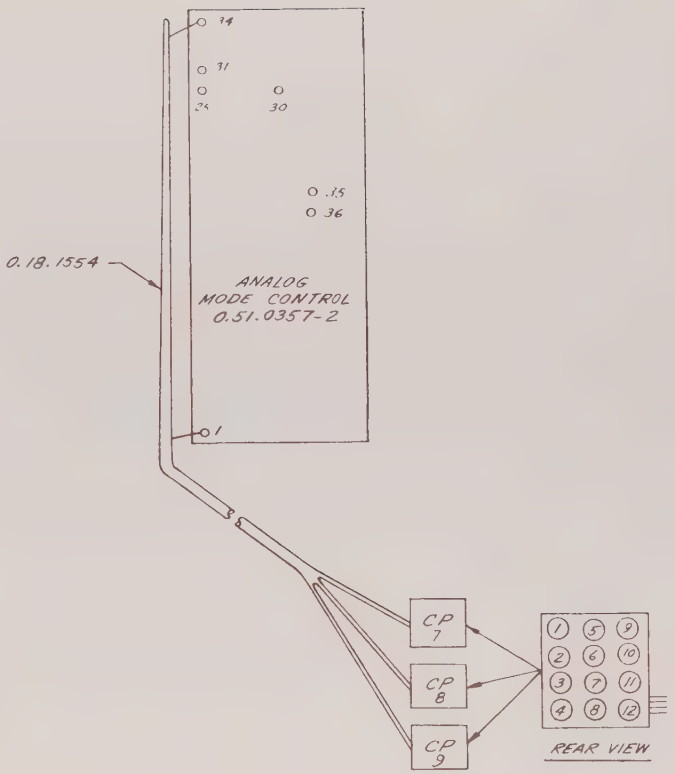


RELEASED FOR PRODUCTION	ENGR	DATE
NO	REVISIONS	APP'D

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

MATERIAL:		DWG. NO. WAS:		SHT. NO.
FINISH:				SIZE
UNLESS OTHERWISE SPECIFIED	SCALE ____	USED ON:		REV. NO.
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pF RESISTANCE IS IN OHMS TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.018 .XXX = ±.008 ∠ = ±1° * TOL. OF MATERIAL SUPPLIED	DRAWN C. BRUNO	DATE 13 SEPT 68	RCDR DATE	PROJECT 103105 C 00 020 1235 0W
	CHKD	DATE	REVWD DATE	
	DSGN F. P. Ouellette	DATE 21 Sept 68	APPVD DATE	SHEET 4 OF SHEETS

AMC		CPP8	CPP9	CPP7
19	PP BLU	1		
17	IC YEL	2		
23	HD VIO	3		
18	OP GRN	4		
21	SP(+5) WHT-GRN	5		
16	ST WHT	6		
36	IC(IND) WHT	7		
35	OP(IND) WHT-GRN	8		
20	PP(READ) BLU	9	SEC I/O 5	WHT-BLU
15	H(READ) VIO	10	9	
14	SP(READ) WHT	11	2MS I/O 7	WHT-BRN
1	-20V		GY 11 1	
2	+5V		GRN-WHT 2	
3	DIG GRD		GY-BLK 3	
4	DIG GRD		GY-BLK 4	
34	SEC(OUT)		WHT-BLU 5	
33	SEC(IN)		BLU 6	
32	2MS(OUT)		WHT-BRN 7	
31	2MS(IN)		BRN 8	
5	SP(-20V)		GY 10	
30	PP(EXT)			WHT-BLU 1
29	IC(EXT)			YEL 2
26	HD (EXT)			VIO 3
27	OP (EXT)			GRN 4
25	SP (EXT)			WHT-GRN 5
28	ST (EXT)			WHT 6
7	PP (WRITE)			BLK 7
8	IC (WRITE)			BRN 8
9	OP (WRITE)			RED 9
10	H (WRITE)			ORN 10
11	SP (WRITE)			YEL 11
12	ST (WRITE)			GRN 12
		12 73 WHT	12	



NO	REVISIONS	APP'V'D
	RELEASED FOR PRODUCTION	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

MATERIAL:

FINISH:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN DF
TOLERANCE OF: .X = ± .03 .XX = ± .02
.XXX = ± .015 .XXX = ± .008 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

SCALE

DWG. NO. WAS:

USED ON:

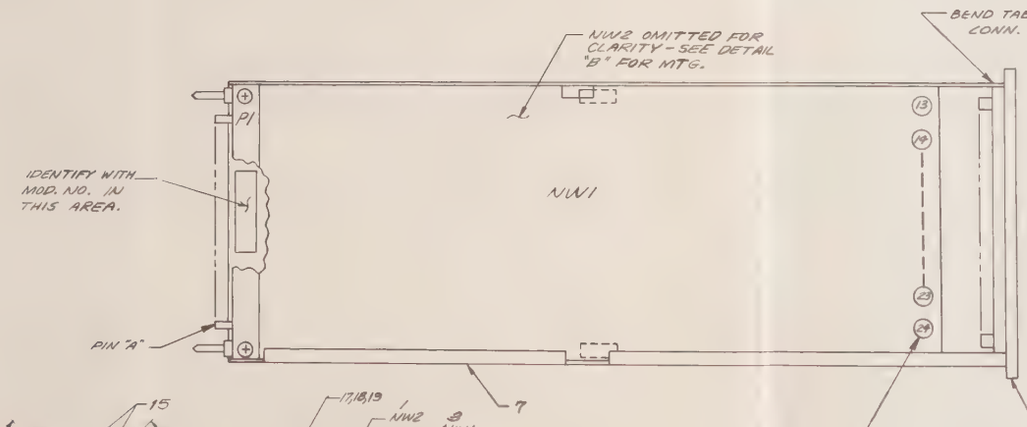
		DATE	RCD'D	DATE
DRAWN	C.BRUNO	15 OCT 68		
CHK'D		DATE	REVW'D	DATE
DSGD	F.P.C.C. H.MATTSEE	DATE 16 OCT 68	APP'VD	DATE

SHT. NO.
SIZE
REV. NO.
PROJECT 103105 C00 020 1235 0W
SHEET 3 OF SHEETS

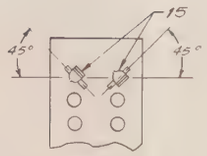
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) WIRES TO BE #22 P.M.W.
   b) COAX PER B00 9½ 0001 0.
2. ⊗ DENOTES LOCATION OF SPRINGS (ITEM #15) PER DETAIL "A".

NW1		NW2		J1
		1	DVM YEL	1
		2	VM YEL	2
		3	IC YEL	3
		4	OP YEL	4
		5	Z (SCOPE) YEL	5
		6	X (SCOPE) YEL	6
		7	Y_1 (SCOPE) YEL	7
		8	Y_2 (SCOPE) YEL	8
		9	X (PLOT) YEL	9
		10	Y (PLOT) YEL	10
		11	ORH YEL	11
		12	OLS YEL	12
13	A SEL		GRN	13
14	PP		GRN	14
15	A (TIMER)		GRN	15
16	$\bar{A}$ (TIMER)		GRN	16
17	RUN (TIMER)		GRN	17
18	TB (TIMER)		GRN	18
19	Y_3 (SCOPE)		GRN	19
20	Y_4 (SCOPE)		GRN	20
21	JN (PLOT)		GRN	21
22	AJ (MDFG)		GRN	22
23	O (MDFG)		GRN	23
24	OVLD		GRN	24

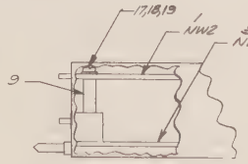
CONN. BLOCK REAR VIEW



CONN. BLOCK FRONT VIEW



DETAIL "A" FRONT VIEW



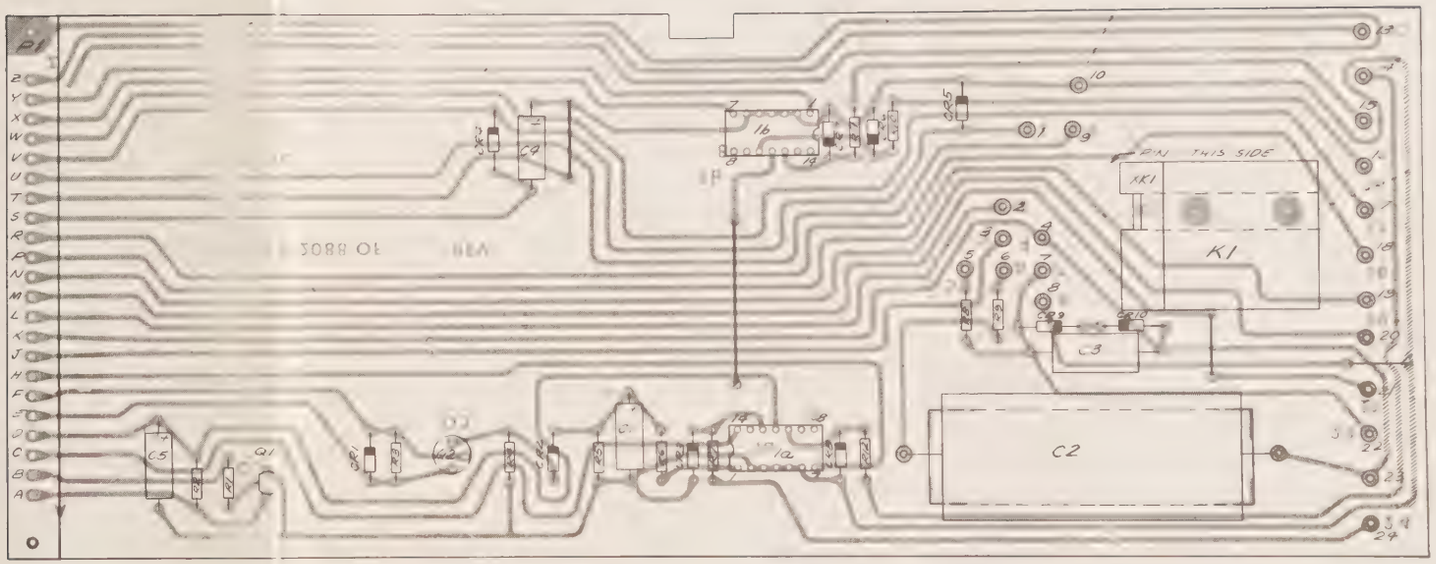
DETAIL "B"

EYELETS IDENTICAL TO J1 CONN. BLOCK ON BOTH CARDS, eg: EYELET 12 IS OPPOSITE J1-12, EYELET 24 IS OPPOSITE J1-24.

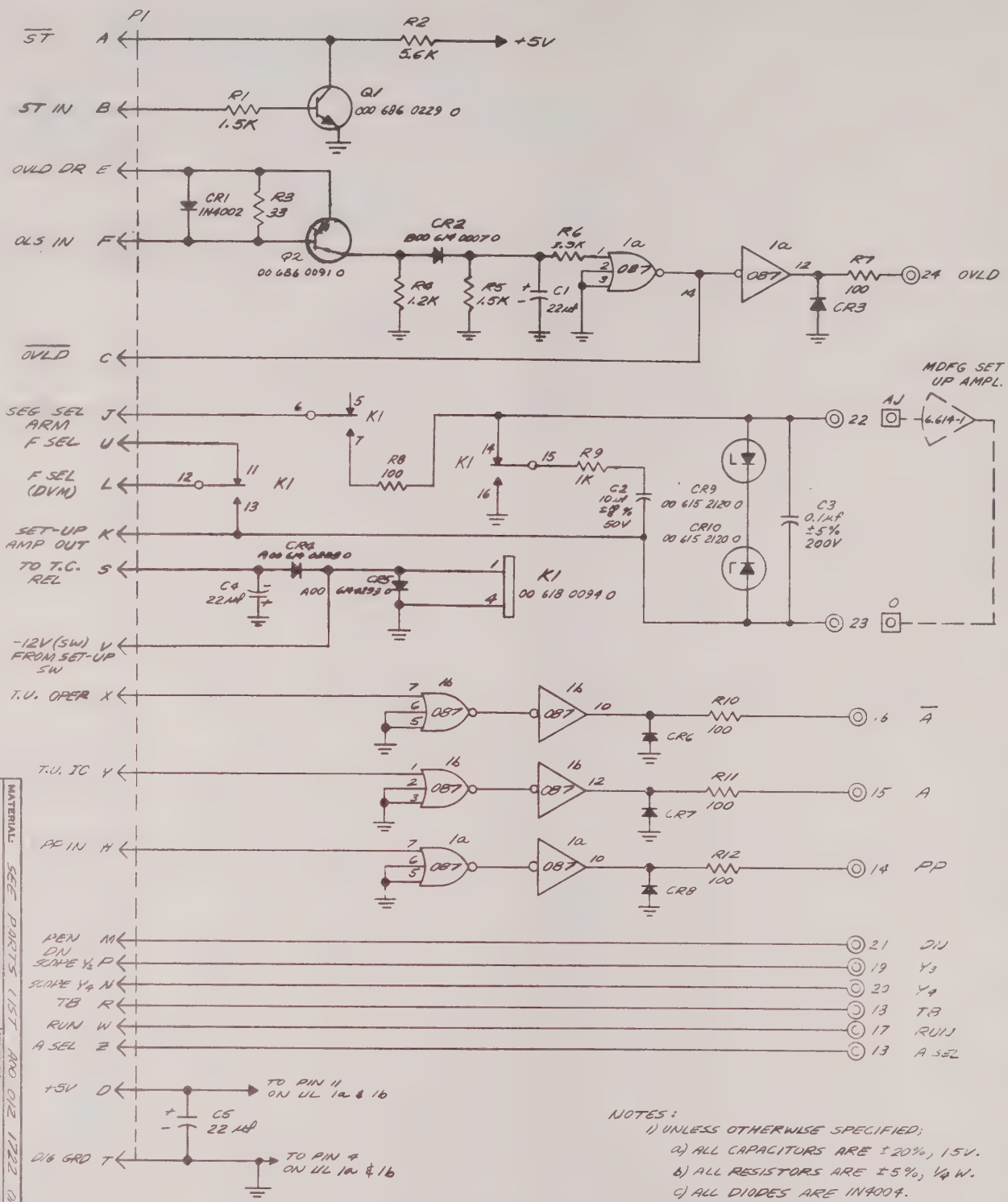
MATERIAL: SEE PARTS LIST A00 012 1700 OP			
FINISH:		WDG. NO. SUB.	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; CAPACITANCE IS IN pF; RESISTANCE IS IN OHMS; TOLERANCE OF: .X = ±.03, .XX = ±.05, ANG = ± 0°15', .XXX = ± .005, ∠ = ±1°; **TOL. OF MATERIAL SUPPLIED	SCALE 1:1	WDG. NO. A00 012 1700 OP	
	DRAWN L.A. FERRO DATE 5 OCT 68	APVD DATE	
	CHKD L.A. FERRO DATE 5 OCT 68	APVD DATE	
	DES'D A. MATTER DATE 13 SEPT 68	APVD DATE	

EAI
ASSEMBLY WIRING CONTROL TRAY (380)

SHT. NO.	
SIZE	
REV. NO.	
PROJECT 103705	D00 012 1700 OP
SHEET 7 OF 7 SHEETS	

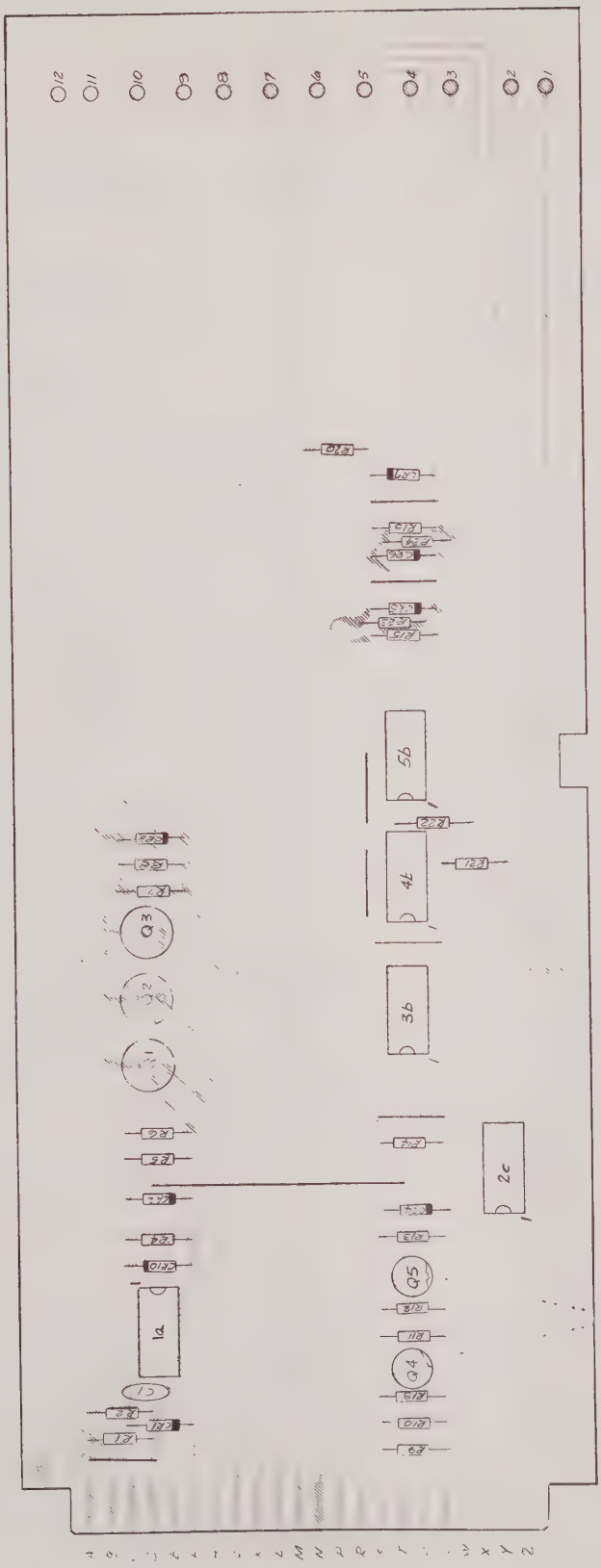


12.1722-0 Control Card 1



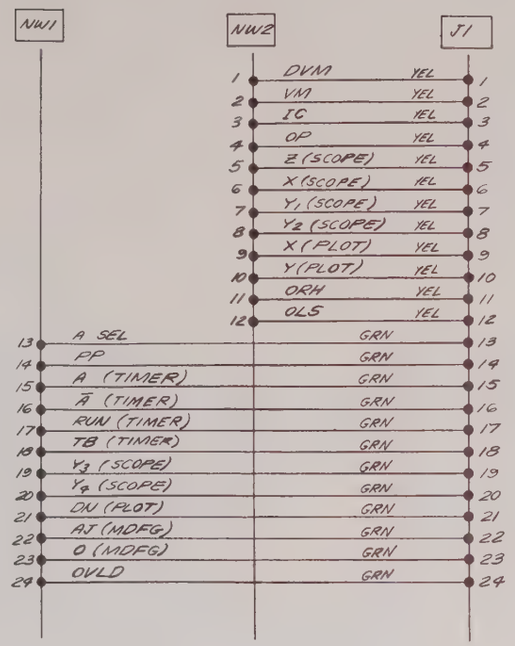
NOTES:
1) UNLESS OTHERWISE SPECIFIED;
a) ALL CAPACITORS ARE ±20%, 15V.
b) ALL RESISTORS ARE ±5%, ¼ W.
c) ALL DIODES ARE IN4004.

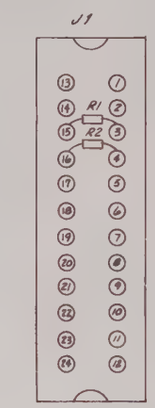
MATERIAL: SEE PARTS LIST
FINISH:
DWG. NO. C00 012 1722 05
SCHEMATIC CONTROL CARD #1
EAI ELECTRONIC ASSOCIATES, INC.
SIZE
REV. NO.
PROJECT
C00 012 1722 05
SHT. NO.
SHEET 1 OF 1 SHEETS
RELEASED FOR PRODUCTION
REVISIONS
NO
DATE
APPVD
REDRAWN TO SPEC.
CR2 MFG CHGD FOR INCREASE RELIABILITY. A FEB 69 PR EAN 380-066-1



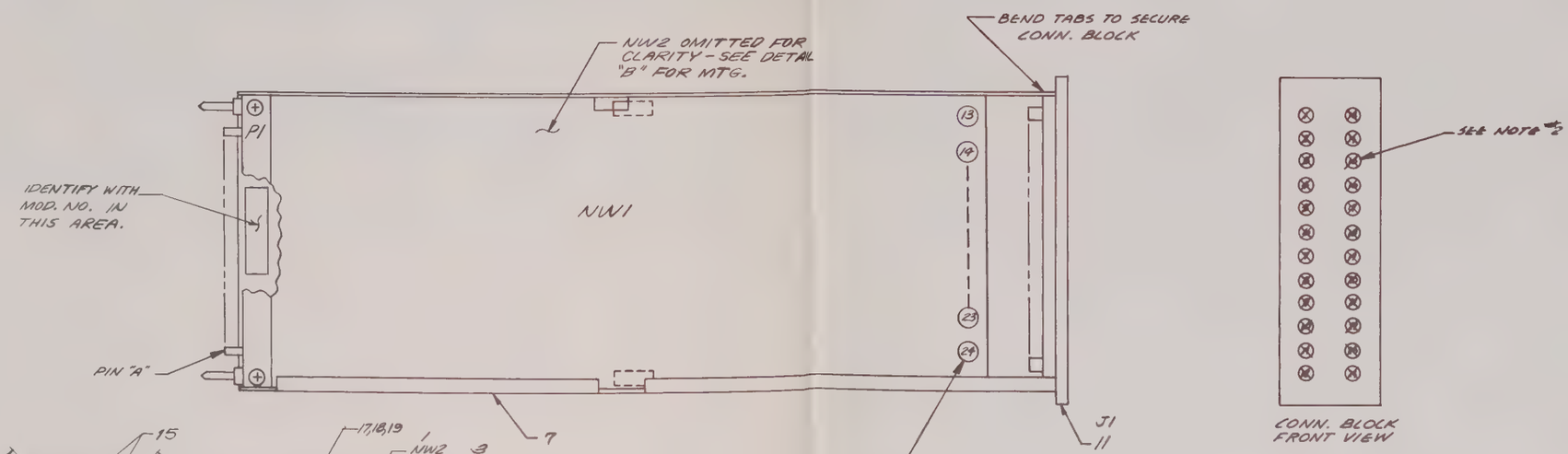
12.1616-0 Control Card 2

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) WIRES TO BE #22 P.H.U.
   b) COAX PER B00916 0001 0.
2. ⊗ DENOTES LOCATION OF SPRINGS (ITEM #15) PER DETAIL "A".

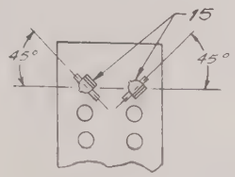

NW1
NW2
J1
1 DVM YEL 1
2 VM YEL 2
3 IC YEL 3
4 OP YEL 4
5 Z (SCOPE) YEL 5
6 X (SCOPE) YEL 6
7 Y1 (SCOPE) YEL 7
8 Y2 (SCOPE) YEL 8
9 X (PLOT) YEL 9
10 Y (PLOT) YEL 10
11 ORH YEL 11
12 OLS YEL 12
13 A SEL GRN 13
14 PP GRN 14
15 A (TIMER) GRN 15
16 Ā (TIMER) GRN 16
17 RUN (TIMER) GRN 17
18 TB (TIMER) GRN 18
19 Y3 (SCOPE) GRN 19
20 Y4 (SCOPE) GRN 20
21 DN (PLOT) GRN 21
22 AJ (MDFG) GRN 22
23 0 (MDFG) GRN 23
24 OVLD GRN 24



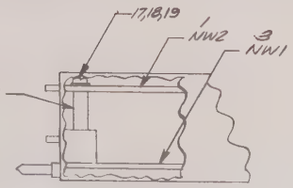
CONN. BLOCK REAR VIEW



CONN. BLOCK FRONT VIEW



DETAIL "A"
FRONT VIEW



DETAIL "B"

REVISIONS			
NO.			APP'D
RELEASED FOR PRODUCTION:	ENGR	DATE	
	Bradley	11/15/68	

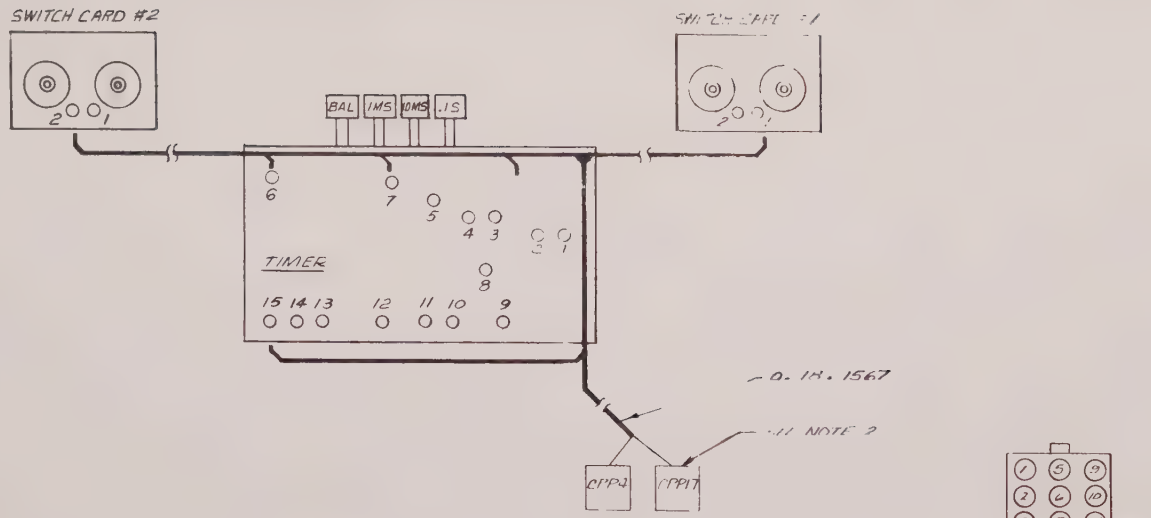
MATERIAL: SEE PARTS LIST A00 012 1700 OP
FINISH:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES CAPACITANCE IS IN μf RESISTANCES IS IN OHMS TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .010 .XYX = ± .005 ∠ = ± 1° * TOL. OF MATERIAL SUPPLIED

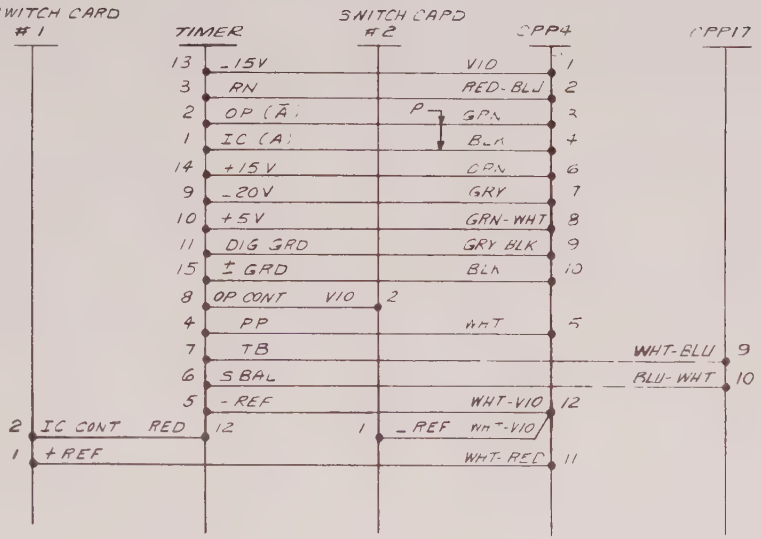
SCALE 1:1	USED ON: A00 012 1700 OP			
DRAWN S.GRABRILL	DATE 27 SEPT 68	ENGR [illegible]	DATE 11/14/68	
CHKD E. ACEBEDA	DATE 3 OCT 68	REVIEW P. Cassidy	DATE 13 Nov 68	
DESN R. TACCI M. MATTER	DATE 13 SEPT. 68	APVD [illegible]	DATE 15 NOV 68	

DWG. NO. WAS
SHT. NO.
SIZE
REV. NO.
PROJECT 103105
D00 012 1700 00
SHEET 1 OF 1 SHEETS

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

ASSEMBLY W/WIRING CONTROL TRAY (380)





NOTES:
1) UNLESS OTHERWISE SPECIFIED:
   a.) WIRES TO BE #22 PHU.
2) WIRES TO BE ADDED TO CONN. CPPIT AT TIME OF INSTALLATION. (CONN. LOCATED ON HARNESS IB. 1552 REF.)

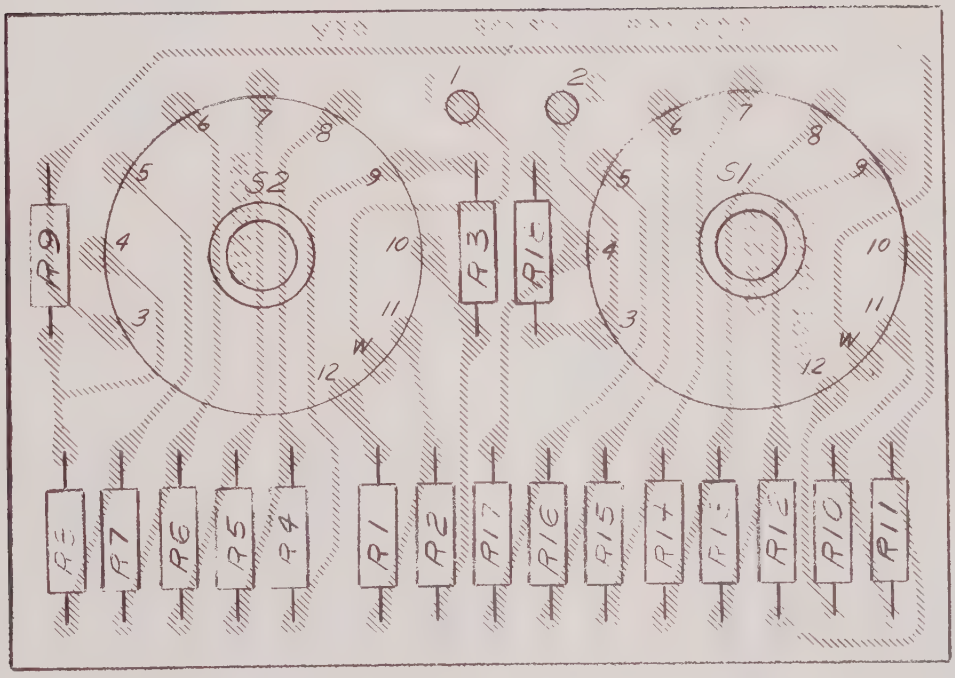
RELEASED FOR PRODUCTION	ENGR	DATE			
	727	2 Nov 68			
NO	REVISIONS		APP'D	DATE	
A					

MATERIAL: SEE PARTS LIST ACC CC2 1395 OP
FINISH:
UNLESS OTHERWISE SPECIFIED
CAPACITANCE IN MMF
RESISTANCE IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED
SCALE —
DRAWN J. PARKINS DATE 11OCT68
CHKD V.L. Kw II DATE 8 Nov 68
ENGR J. PUCCI DATE 14 OCT 68
DFG. NO. WAS:
USED ON: ACC 002 1395
RCDS. DATE 11/7/68
REVWD A. Cassidy DATE 7 Nov 68
APP'D DATE

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

WIRING
TIMING UNIT EXPANSION
(380)

SHT. NO.
SIZE
REV. NO.
PROJECT 103105
C00002 1395 0W
SHEET 1 OF 1 SHEETS



51.0440-0 Switch Card

NOTES:
1. UNLESS OTHERWISE SPECIFIED;
   a. RESISTOR ARE ±5%, 1/4 W.
   b. DIODES ARE A00 614 0233 0.
   c. TRANSISTOR ARE EAI # C00 636 0223 0
2. ON ALL IC P'S PIN 4 GOES TO DIG GRD AND PIN 11 GOES TO +5V.

P1

OP BUS P
OP IN N
OP IND W
IC IND A
IC BUS V
IC IN M
PP IN X
$\overline{SP}$ C
$\overline{SP1}$ B
SP IN R
OLS. OUT F
BLANKING OUT S
Y E
X H
Y_2 J
Y_1 K
X L
VM Y
DVM Z
-20V U
-5V D
DIG. GRD T

100 5b
096 4b
090 3b
090 2c
090 1a

R21 1.5K
R22 1.5K
R15 1.5K
R23 1.5K
CR5
R18 1.5K
R24 1.5K
CR6
CR7
R20 1K
R2 5.6K
R1 5.6K
R6 390
Q1
R5 390
Q2
Q3
R8 1.5K
CR3
R7 1.5K
R4 1.5K
CR2
CR10 B00 648 0004 0
CR1
C1 10mf
R19 1.2K
-20V
R12 5.6K
R13 27K
Q4 2N3638
R11 5.6K
R9 1K
R10 5.6K
Q5 2N3644
CR4
R14 1K

OP
IC
OLS
ORH
Z
Y
X
Y_2
Y_1
X
VM
DVM

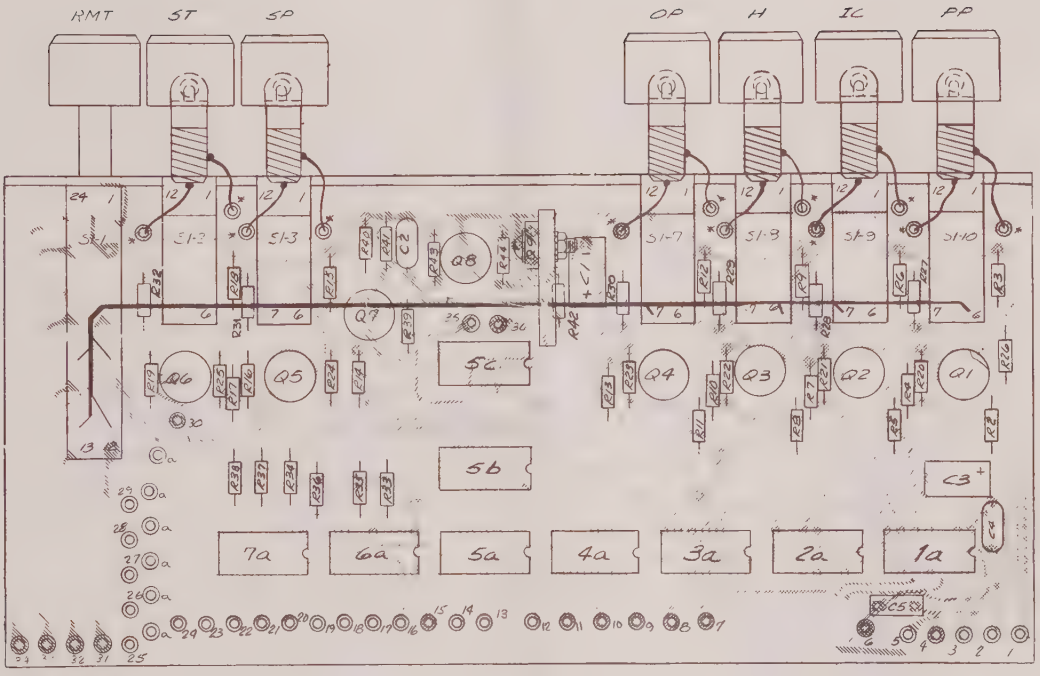
RELEASED FOR PRODUCTION	ENGR. PHS	DATE 2-16-67

NO	REVISIONS	APP'D
	Bruno Key 3/23/67	
1	IN AREA 'F' CR8, 9, 10 WERE R16, R17, & R3, 1.5K NOTE 1a WAS G14 0043 0 C14, D TO PROTECT I.C. WHEN AN IMPROPER VOLTAGE IS APPLIED 27 APR 67 ERN 11,089	PHS
2	AREA F-5 & 6. R23 & 24 WERE NOT SPEC'D. REASON: TO ELIMINATE THE TIME DELAY BETWEEN OPERATE & RESET. RC 1 JUNE 67 ERN 11169	
3	AREA C-D 3 Q5 WAS 2N3638 & R14 WAS 1.8K. AREA G4, R20 WAS 1.8K. REASON: TO IMPROVE OPERATION OF THE BLANKING CIRCUIT. 28 NOV 67 ERN 11,458	
4	AREA F, G-5, "CR6" WAS "CR9" (648 004 0) CR6 WAS LOC'D BETWEEN R18 & PIN 3, (CATH TO R18). AREA F, G-6, CR5 WAS CR8 (648 004 0) CR5 WAS LOC'D BETWEEN R15 & PIN 4, (CATH TO R15). (CR8&9 CATH TO) REASON: TO IMPROVE OPERATION OF BLANKING CIRCUIT IC & OP BUSS DRIVERS. 9 DEC 67 ERN 11,552	

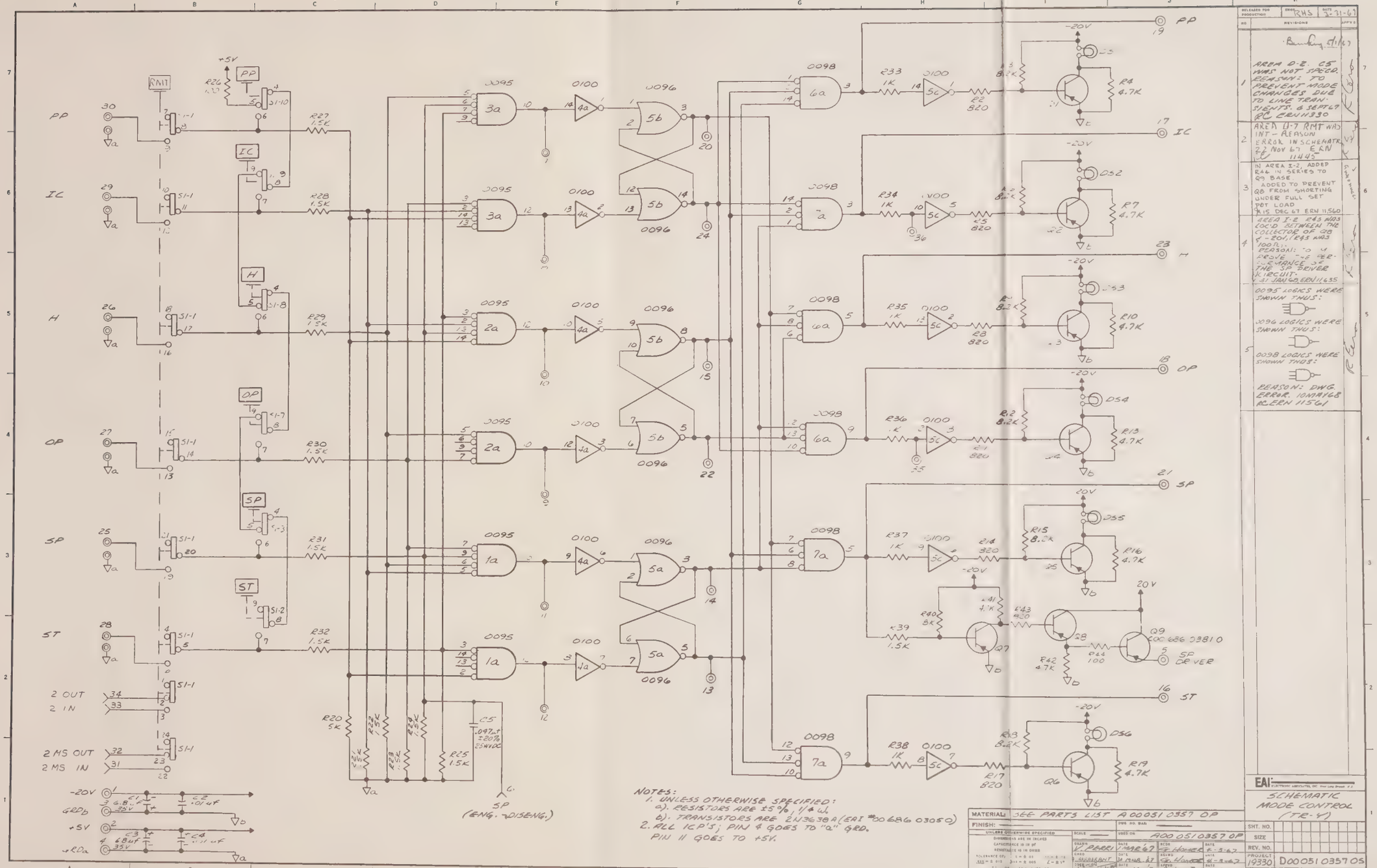
EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

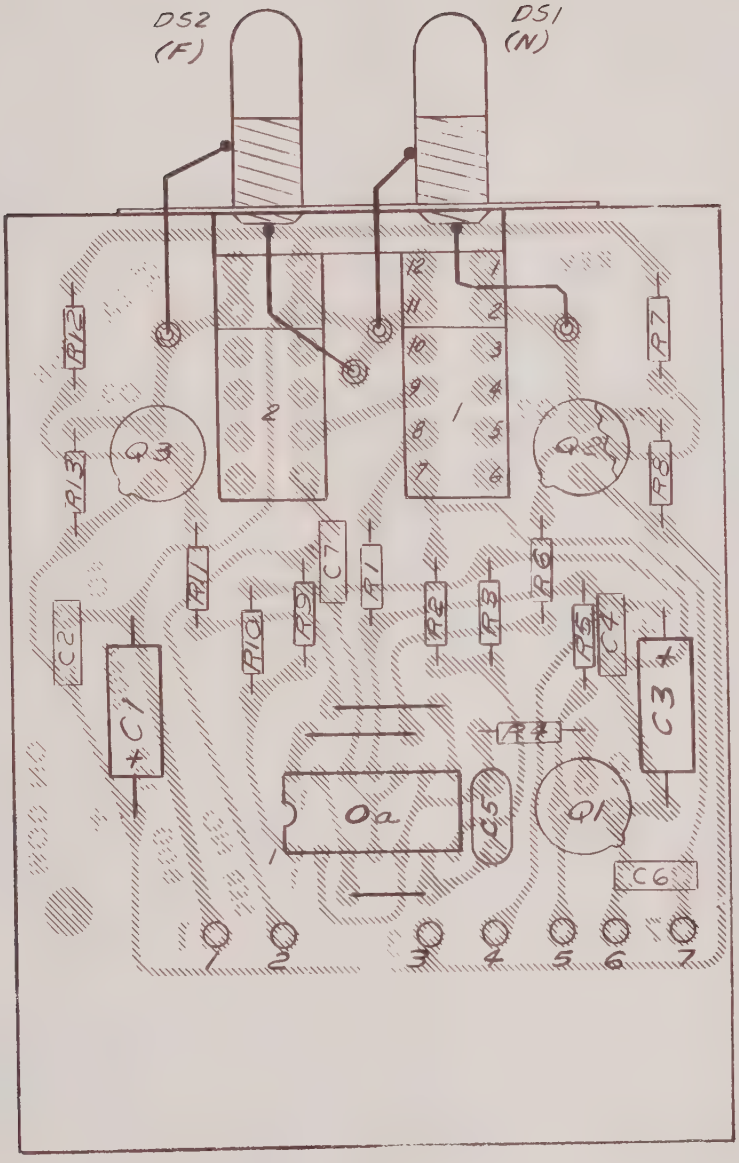
SCHEMATIC CONTROL CARD #2 (TR-Y)

MATERIAL: SEE PARTS LIST A00 012 1616 OP							
FINISH: —					DWG NO. WAS: —		SHT. NO.
UNLESS OTHERWISE SPECIFIED	SCALE —				USED ON A00 012 1616 OP		SIZE
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN mf RESISTANCE IS IN OHMS TOLERANCE OF: .X = ± .03 .XX = ± .03 .XXX = ± .013 .XXX = ± .005 ∠ = ± 1° * TOL. OF MATERIAL SUPPLIED	DRAWN K KAJ	DATE 9 FEB 66	RECD J Homer	DATE 9-23-67	REV. NO.		
	CHKD ~~C F Homer~~	DATE 9-23-67	REVWD J.C. & Homer	DATE 9-23-67	PROJECT 1936		A00 012 1616 05
	DSGR ~~A Novatin~~	DATE 3/10/67	APP'D A Novatin	DATE 3/10/67	SHEET 1 OF 1 SHEETS		

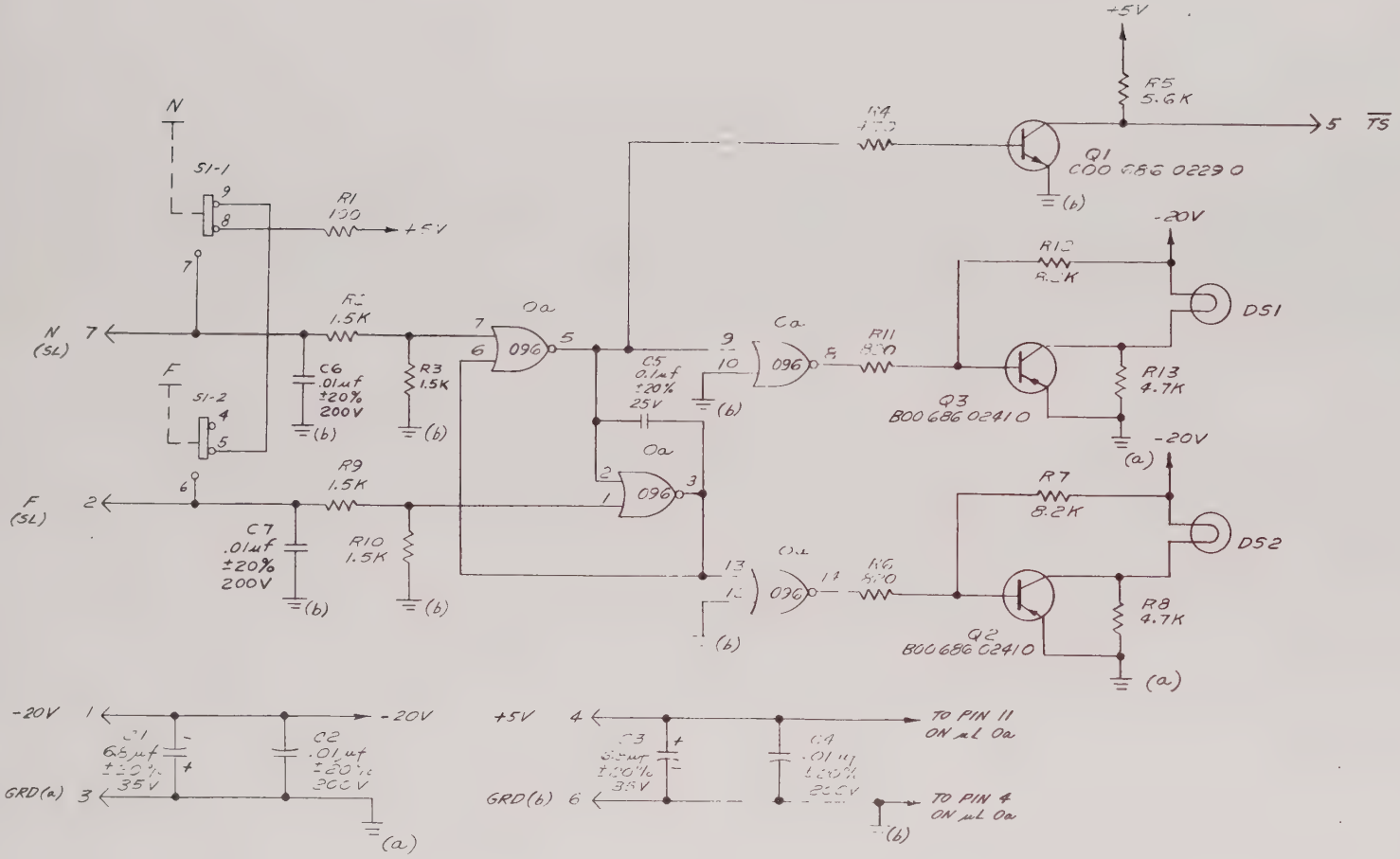


51.0357-0 Mode Control


RMT
PP
IC
H
OP
SP
ST
+5V
-20V
GRD
2 OUT
2 IN
2 MS OUT
2 MS IN
0095
0096
0098
0100
R20 5K
R21 1.5K
R22 1.5K
R23 1.5K
R24 1.5K
R25 1.5K
C5 .047µf ±20% 25WVDC
5P (ENG. -DISENG.)
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a). RESISTORS ARE ±5%, 1/4 W.
b). TRANSISTORS ARE 2N3638A (EAI #200686 03050)
2. ALL IC P'S; PIN 4 GOES TO "Q" GRD.
PIN 11 GOES TO +5V.
RELEASED FOR PRODUCTION
AREA D-2. C5 WAS NOT SPECD. REASON: TO PREVENT MODE CHANGES DUE TO LINE TRANSIENTS. 6 SEPT 67 RC ERN 11330
AREA U-7 RMT WD INT - REASON ERROR IN SCHEMATIC 22 NOV 67 ERN 11445
IN AREA I-2, ADDED R46 IN SERIES TO Q9 BASE ADDED TO PREVENT Q8 FROM SHORTING UNDER FULL SET POT LOAD. RJS DEC 67 ERN 11560
AREA I-2, 243 NOR LOCID BETWEEN THE COLLECTOR OF Q8 & -20V, 1243 WAS 100Ω. REASON: TO IMPROVE THE PERFORMANCE OF THE SP DRIVER CIRCUIT. JAN 68 ERN 11635
0095 LOGICS WERE SHOWN THUS:
0096 LOGICS WERE SHOWN THUS:
0098 LOGICS WERE SHOWN THUS:
REASON: DWG. ERROR. 10 MAY 68 RC ERN 11561
EAI
SCHEMATIC MODE CONTROL (TR-48)
MATERIAL: SEE PARTS LIST A00051035T OP
FINISH:
DWG NO. A00051035T OP
SHT. NO.
SIZE
REV. NO.
PROJECT 19330
D00051035T 05
SHEET 1 OF 1 SHEETS



51.0437-0 Time Scale Card



NO	REVISIONS	APP'D
12	IN AREA E-4, "C5" CAP WAS NOT SPEC 30 [illegible]	[illegible]
	[illegible] ; 10/18/68	
1	AREA C-5 & C-4: C6 & C7 WERE NOT SPEC'D. - REASON: TO ELIMINATE SWITCHING OF MODES WHEN SLAVING 380 IP 18MAR69 ERN 380-087-0	

RELEASED FOR PRODUCTION: DATE 2/17 DATE 10/17/68

MATERIAL: SEE PARTS LIST A00 051 0437 OP

FINISH: —

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: X = ±.03 .XX = ±.02 .XXX = ±.015 .XXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED

SCALE —

DRAWN C. BRUNO DATE 6 SEPT 68
CHKD. [illegible] DATE 14 Oct 68
DESIGN [illegible] DATE 21 SEPT. 68

DWG. NO. WAS: —

USED ON: A00 051 0437 OP

REVD [illegible] DATE 10/[illegible]/68
REVD H. Cassidy DATE 14 oct 68
APPD H. Nowalk DATE 15 Oct 68

EAI ELECTRONIC ASSOCIATES, INC. Port Long Branch, N.J.

SCHEMATIC
TIME SCALE CARD
(PTC-1)

SHT. NO.
SIZE
REV. NO.
PROJECT 103105
C00 051 043705
SHEET OF SHEETS

CHAPTER

CHAPTER 4

READOUT SELECTOR SYSTEM

4.1 INTRODUCTION

The readout selector system provides a simple means of reading out voltages of the analog components and addressing the attenuators for setting. (The attenuator system is described in Chapter 5 of this handbook.)

The readout selector system consists of the 0.51.0435 Address Select and Tens Card, a 0.51.0436 Units Select Card and 0.12.1720 and 0.12.1721 Relay Select Cards. The address select and tens card and the units select cards are mounted on the 0.20.1235 Analog Control Panel with their respective pushbuttons available at the front of the panel (Figure 4.1). The relay select cards are mounted in the center of the console frame and are accessible from the rear of the computer (Figure 4.2).

Figure 4.1. Location of Address Select Switches

Table 4.1 identifies and describes the functions of the switches associated with the address select card.

The units and tens switches are used to select the particular unit that is to be read out. The first or left column of numbers is the ten position, while the second, or right column is the unit portion.

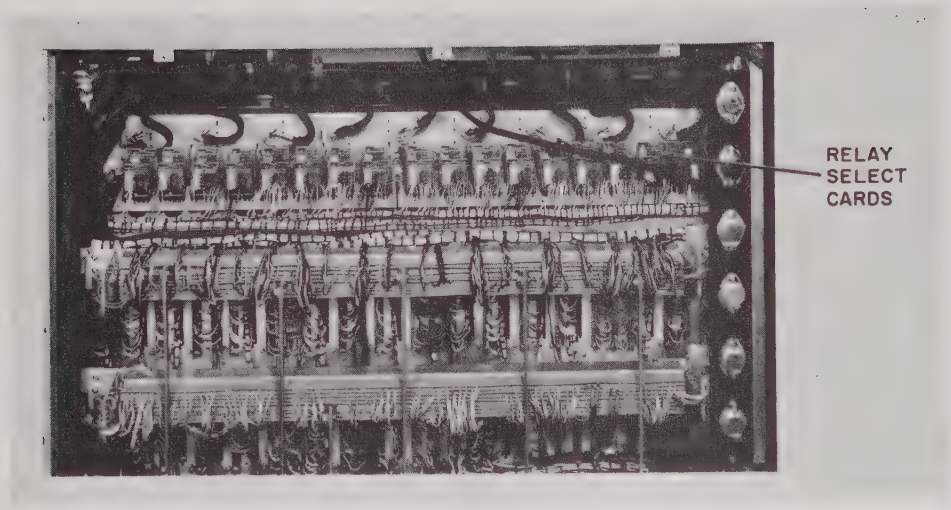


Figure 4.2. Location of Relay Select Cards

Table 4.1. Address Select Mode Functions

Pushbutton	Function
DIG I/O	This button will be used in eventual hybrid configuration.
PP	This pushbutton is used to connect the DVM patch terminal on the 0.12.1700 Control Tray to the DVM input.
F	Depressing this pushbutton allows the amplifiers located in the 0.12.1345 MDFG Amplifier Network or the patched MDFG Set-Up Amplifier to be read out on the DVM.
D/10	This pushbutton is used for a derivative readout from the summing junctions of the integrators and track/store units. The voltage readout is divided by a factor of 10. (Positions A3 and A14 have no derivative readout capabilities.)
P	The P (potentiometer) pushbutton connects the arm of the potentiometer addressed to the VM and DVM.
A	The A (amplifier) pushbutton, when depressed, switches the output of the selected amplifier (A00 to A29) or trunks A30 to A39 to the DVM input.

NOTES

1. *Positions A4 and A13 have no derivative readout capability.*
2. *380 must be equipped with a DVM for Derivative readout.*

4.2 CIRCUIT DESCRIPTION

This paragraph contains the description of the individual switching circuits associated with the readout selector system. Each circuit is described in a separate paragraph. Figure 4.3 is a simplified schematic of the overall system.

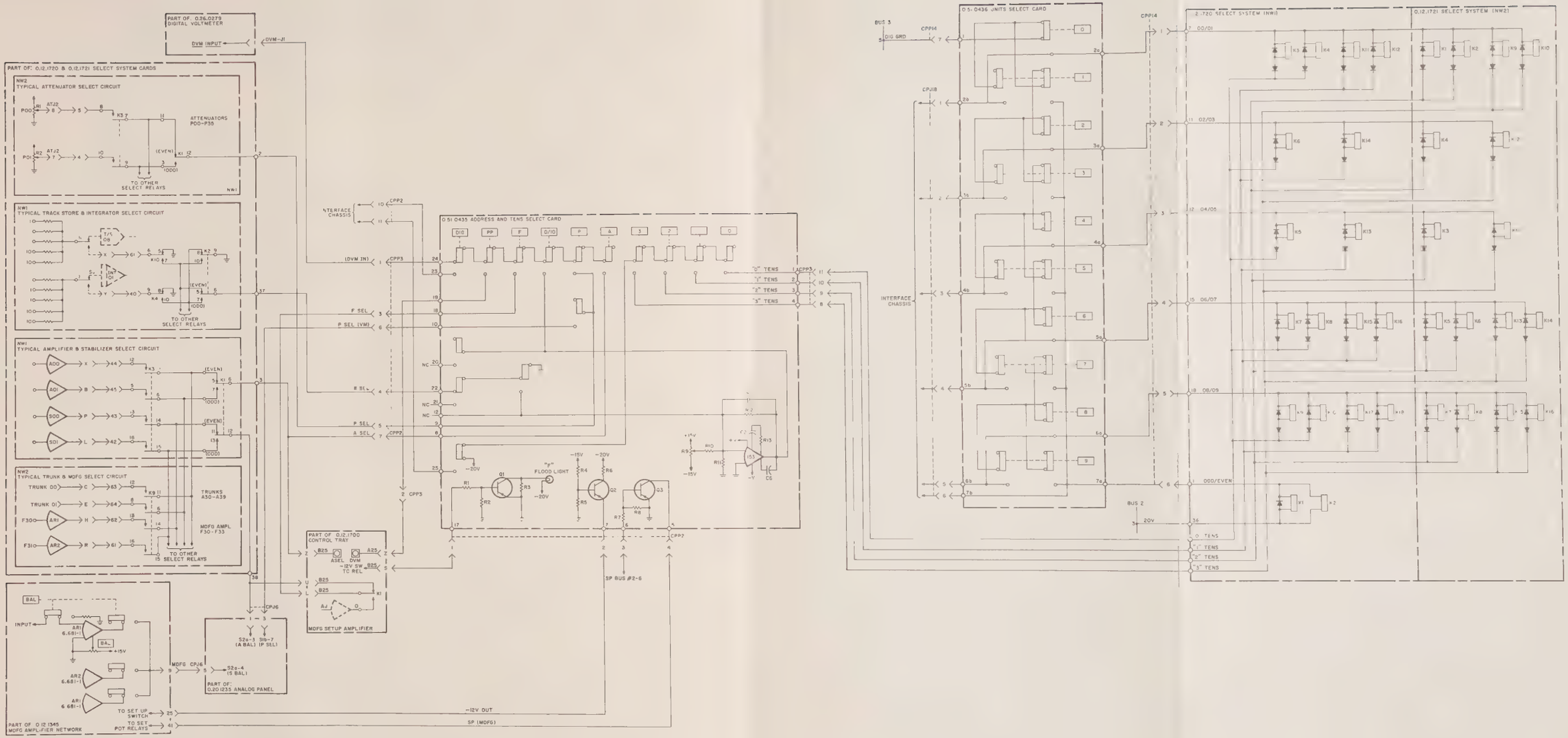


Figure 4.3.
Signal Selector System,
Simplified Schematic

4.2.1 Digital I/O Switch Circuits

The Digital I/O (DIG I/O) switch is used when the 380 is connected with a digital computer in a hybrid configuration. Depressing the DIG I/O switch transfers control of the readout selector system from the 380 to a digital computer connected through some external interface chassis. This switch should *not* be used unless the 380 and the digital computer are connected in a hybrid configuration.

4.2.2 PP (Patch Panel) Switch Circuit

Depressing the Patch Panel (PP) pushbutton, switches the DVM input to the DVM patch terminal on the 0.12.1700 Control Tray.

4.2.3 F Switch Circuit

The F switch circuit is used to readout the MDFG amplifiers and the patched MDFG set-up amplifier. The state of the relay in the MDFG readout circuit determines which amplifier is read out. The MDFG readout circuit is described in the 380 Computing Components manual (Publication Number 00 800.2066-0).

4.2.4 D/10 (Derivative Divided by 10) Switch Circuit

The D/10 pushbutton is used to readout the sum of the voltages applied through the input resistors associated with the integrator and track/store units (Figure 4.4).

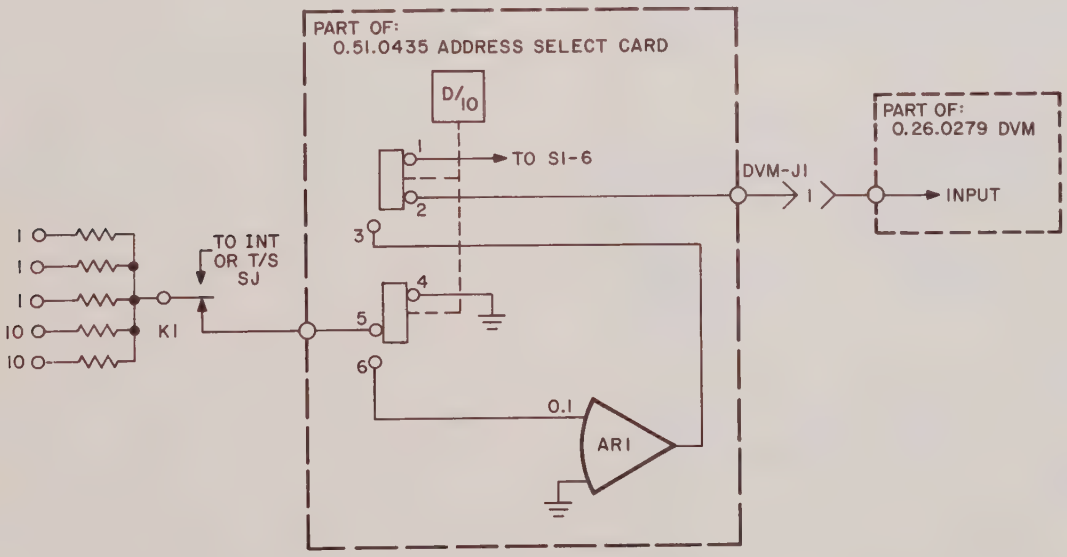


Figure 4.4. D/10 Switch Circuit, Simplified Schematic

To check the derivative voltage at the input to the integrators and the track/store units, the 380 should be in the ST (Static Test) mode. In this mode, Relay K1 is energized and the sum of the input voltages is applied to Pin 5 on the D/10 switch. The D/10 switch, when closed, connects the derivative line to the input of the derivative amplifier AR1 which produces

$-\sum_{i=1}^{N} = \frac{Vi}{10}$, which in turn, is connected to the DVM. Consequently, the DVM reading is -1/10 of the summation input voltages.

4.2.5 P (Potentiometer) Switch Circuit

The P (potentiometer) switch provides two sets of contacts to connect the arm of a potentiometer to both the DVM and VM inputs. When the P button is depressed, Contacts 2 and 3 (Figure 4.3) connect the arm of the potentiometer to the DVM input. Contacts 7 and 8 also connect the arm of the potentiometer through the VM function switch (P SEL position) to the input of the voltmeter. The voltmeter reads the potentiometer when the RANGE switch is in the NULL position only. This is used when the DVM is not available.

4.2.6 A (Amplifier) Switch

The A (amplifier) switch utilizes one set of contacts to connect the amplifier being read out to the DVM input.

Switch Contacts 2 and 3, when closed, provide an input to the DVM (see 51.0435 0S).

The A SEL line is connected through a series of relays to the output of the Addressed Amplifier (see Figure 4.3).

4.2.7 Address/Select Circuit

The address/select circuit consists of a Model 0.51.0436 Units and an 0.51.0435 Address and Tens Selector printed circuit cards, and an 0.12.1720 (NW1) and an 0.12.1721 (NW2) Relay Circuit cards. The address/select circuitry is shown in Figure 4.3, (Sheet 1 and 2).

The address/select system allows the operator to address a particular component for readout. It should be noted that a particular address selects amplifiers, MDFG amplifiers, stabilizers and potentiometers. If a potentiometer is to be read out, the P pushbutton is depressed, the A pushbutton is depressed if an amplifier is to be read out and the F pushbutton is depressed if MDFG amplifiers are to be read out. Since the stabilizers are read out on the voltmeter, it is necessary to place the VM FUNCTION switch in the A BAL position to read out the addressed stabilizer. To balance MDFG amplifiers, the VM FUNCTION switch must be placed in the S BAL.

To address a particular component, simply depress the pushbutton representing the tens digit in the left column, then depress the pushbutton representing the units digit in the right-hand column. For example, addressing the component in Position 19 is accomplished by depressing Pushbutton 1 in the left column and Pushbutton 9 in the right-hand column. Since any address must contain two digits, a 0 is assumed to preceed any single digit address, i.e., Component 8 is addressed as 08.

Once the proper pushbuttons have been depressed, relays on the select card are energized and the addressed unit is selected for readout. The select system uses an odd/even concept to minimize the number of relays. Depressing any of the odd Units 1, 3, 5, 7, 9, will energize K1 and K2 on Figure 4.3. For even units, the relay is not energized. As an example, address amplifier 00 using the select circuits shown in Figure 4.3. Depressing the tens Pushbutton 0 applies -20V to one side of Relays K3 and K4. Depressing Units 0 grounds the other side of Relays K3 and K4 causing them to become energized. Amplifier A00's output is connected to Pin 12 of Relay K3. Since this relay is energized, the amplifier output is then connected through the wiper to Pin 5 on K1, the odd/even relay. Since 00 is an even digit, K1 is not energized and the amplifier output is connected through the wiper arm, Pin 6 to the 0.51.0435 Address Card and to the DVM. It can be seen that by having selected A, the A select line is connected through Pins 2 and 3 on the multiple switch (A) to the DVM input. If A01 is selected, the only difference in operation is that K1 is energized and the output of Amplifier A01 is connected through Pins 5 and 6 on K3, and Pins 6 and 7 on K1 to the DVM.

Amplifier 00 is associated with an integrator, and K4, also energized, is used for the derivative readout. To read the derivative current patched into Integrator 00, select D/10 00. Relay K1 in the appropriate 0.12.1611 Integrator energizes, transferring the input current to the wiper arm of K4. Since K4 is energized, this transfers the current to Pin 5 of K2. The wiper arm (Pin 6) of K2 is in turn connected to the derivative select line. For the odd relay, D/10 01, K2 is energized and the derivative current from 01 is tied to the derivative select line through Pins 7 and 6.

As seen on Figure 4.4, the derivative current of a non selected amplifier is always returned to ground providing a proper load for pots patched to the input. The derivative select line, when D/10 is pushed, is connected to the summing junction of the derivative amplifier. This amplifier (AR1) converts the derivative current to a voltage which in turn is connected to the DVM input. The track/store units are treated in an identical manner to the integrators.

The potentiometers are selected in a grid or matrix circuit identical to the amplifiers and derivatives. Additional contacts on Relay K3 pull in the wiper arm of Pots P00 and P01. For P00, the odd/even relay is not energized and the wiper arm of the pot is connected to the DVM, as shown through the P pushbutton on the 0.51.0435 Address Card. For P01, the odd/even Relay K1 is energized and follows the same path to the DVM.

The stabilizers for Amplifier 00 and Amplifier 01 are also readout through additional contacts on Relay K3, and are connected through the odd/even relay (K2 Pin 12) to the stabilizer select line which terminates on the voltmeter Card S2a-3 on the 0.12.1235 Analog Control Panel.

The MDFG amplifiers, read out on the F select line, are identified as F30 through F33 for readout purposes. The F SEL and S BAL lines are common to the 0.12.1720 Select System Card (Eylet 38). The F SEL goes through Relay K1 on the 0.12.1700 Control Tray for use in MDFG setup. See the 380 Computing Components Manual (Publication Number 00 800.2066-0) for the description of the F SEL circuit.

Contacts 5 and 6 on the F switch (Figure 4.3) connect the F line to the DVM. The operation of Relay K9 and the odd/even Relay K2 is identical to the descriptions given earlier in this paragraph.

There is *no* selection associated with balancing the MDFG amplifiers. A momentary pushbutton, adjacent to each amplifier on the 0.12.1345 MDFG Amplifier Network Card, connects the amplifier output to S BAL on the VM selector switch. Selecting S BAL permits the amplifier to be balanced.

When the DIG I/O switch is depressed, the -20 volts normally applied to the address/select switches and the DVM, are available to an interface chassis for hybrid operation.

4.2.8 The VOLTMETER (VM) Circuit

The VOLTMETER (VM), Figure 4.5, located on the analog control panel directly beneath the logic unit, consists of a Model 0.51.0438 Overload/VM Card, a FUNCTION switch, and a RANGE switch. The overload portion of the circuit consisting of Q1, Q2, LS1 and their associated circuitry, is described with the Overload Indicators, Chapter 6 of this handbook.

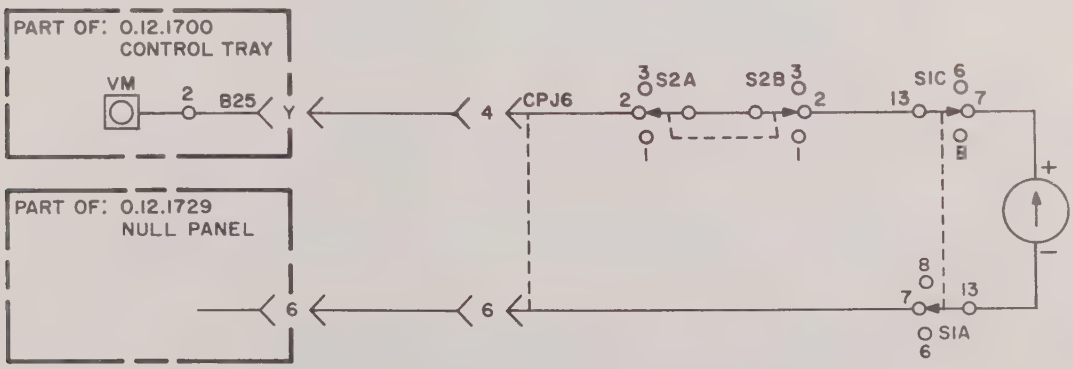


Figure 4.5. Null Circuit, Simplified Schematic

The modes of the VM are selected by the FUNCTION switch located on the lower right of the VM. Table 4.2 describes each FUNCTION switch position.

Table 4.2. Descriptions of FUNCTION Switch Positions

Mode	Function
OFF	Disconnects VM input.
PP	Connects VM to the VM patch terminal on the 0.12.1700 Control Tray.
A BAL	Connects the VM to the stabilizer of a selected amplifier for balancing.
S BAL	Connects the VM to a selected MDFG amplifier or Rep-Op timer amplifiers output for balancing.
P SEL	Connects the VM to the wiper of the selected Pot for use with the Null Panel.
-RV	Connects the VM to the -relay bus.
-15V	Connects the VM to the -15 volt bus.
-10V	Connects the VM to the -10 volt reference bus.
5	Connects the VM to the +5 volt bus.
10	Connects the VM to the +10 volt reference bus.
15	Connects the VM to the +15 volt bus.
30	Connects the VM to the +30 volt bus.

The 30, 10, 3, 1, .3, and .1 positions on the RANGE switch are used to scale the input voltage by connecting precision resistors between the voltage input and the VM. The NULL position provides circuitry (Figure 4.5) to accurately set voltages in the absence of a DVM. The procedure for setting voltages using the nulling method is given below.

1. Place the FUNCTION switch in the PP position.
2. Place the RANCE switch in the NULL position.
3. Patch the voltage to be adjusted or A SEL to the VM patch terminal on the 0.12.1700 Control Tray.
4. Select the desired voltage value using the null pot.
5. Complete the procedure by adjusting the voltage patched to the VM terminal until the voltmeter indicates a null point (0 volt).

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.12.1720 Select System (NW1)	4-11
0.12.1721 Select System (NW2)	4-11
0.20.1235 Analog Control Panel	3-19
0.51.0435-1 Address Select Card	4-12
0.51.0436-1 Units Select	4-13
0.51.0438-0 Overload Voltmeter Card	4-14

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	CR1,10 thru 14,23 thru 27	Diode	00 614.0293-0	B
2	CR2 thru 9, 15 thru 22	Diode: 1N4002	00 614.0110-0	A
3	K1,2,4,8, 10,12,16,18	Relay: 18V, 520 ohm Coil; 4 Form C Contacts (Allied Control T-154-4C-520 or equal)	00 618.0171-0	A
4	K3,5,6,7,9, 11,13,14, 15,17	Relay: 18V, 520 ohm Coil; 6 Form A Contacts (Allied Control T-154-6A-520 or equal)	00 618.0172-0	A
5	XK1 thru 18	Socket, Relay: 16 Contacts (Allied Control 30055-4 or equal)	00 650.0133-0	A
		0.12.1721 SELECT SYSTEM (NW2)		
1	CR1 thru 8, 14 thru 21	Diode: 1N4002	00 614.0110-0	A
2	CR9 thru 13 22 thru 26	Diode	00 614.0293-0	B
3	K1,3,4,5,7, 9,11,12, 13,15	Relay: 18V, 520 ohm Coil; 6 Form A Contacts (Allied Control T-154-6A-520 or equal)	00 618.0172-0	A
4	K2,8	Relay: 18V, 520 ohm Coil; 4 Form C Contacts (Allied Control T-154-4C-520 or equal)	00 618.0171-0	A
5	XK1 thru 16	Socket, Relay: 16 Contacts (Allied Control 30055-4 or equal)	00 650.0133-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
SELECT SYSTEM (NW1)

MODEL NO.
0.12.1720 Sh. 1 of 1 Sh.

0

DATE 12/ 20 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
	AR1	Integrated Circuitry: Operational Amplifier	00 592.0153-0	B
2	C1	Capacitor, Fixed, Film: 0.0022 uf ±10%, 200V (Sprague 192P or equal)	00 522.1222-1	A
3	C2	Capacitor, Fixed, Ceramic: 100 pf ±5%, 200V (Erie Type 835 or equal)	00 511.1101-2	A
4	C3,4,5	Capacitor, Fixed, Electrolytic: 6.8 uf ±20%, 35V (Sprague Type 150D or equal)	00 517.1685-4	A
5	C6	Capacitor, Fixed, Ceramic: 560 pf ±5%, 200V (Erie Type 835 or equal)	00 511.1561-2	A
6	C7	Capacitor, Fixed, Ceramic: 0.01 uf ±20%, 200V (Erie Type 8131 or equal)	00 511.4103-4	A
7	DS1	Lamp, Incandescent: 28V, 40 mA Clear T-1-3/4 Bulb (Hudson 369 or equal)	00 578.0089-0	A
8	Q1	Transistor	00 686.0325-0	B
9	Q2	Transistor: 2N3740	00 686.0310-0	A
10	Q3	Transistor	00 686.0241-0	B
11	R1,11	Resistor, Fixed, Composition: 10K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0103-0	A
12	R2,3,7	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
13	R4	Resistor, Fixed, Composition: 110 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0111-0	A
14	R5	Resistor, Fixed, Composition: 390 ohms ±5%, 1W (Allen-Bradley GB or equal)	00 627.0391-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

ADDRESS SELECT CARD

MODEL NO.

0.51.0435-1 Sh.1 of 2 Sh.

0

DATE 12 / 20 /68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
15	R6	Resistor, Fixed, Wirewound: 10 ohms ±5%, 5W @25°C (Int. Resistance Corp. Type PW5 or equal)	00 636.0568-0	A
16	R8	Resistor, Fixed, Composition: 390 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0391-0	A
17	R9	Potentiometer: 20K ohms ±10%, 1W (Bourns 3005 or equal)	00 643.1203-4	A
18	R10	Resistor, Fixed, Composition: 3 megohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0305-0	A
19	R12	Resistor, Fixed, Film: 10K ohms ±0.1%, 1W @70°C (Pyrofilm PME-70 or equal)	00 633.1002-8	A
20	R13	Resistor, Fixed, Composition: 1.5K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0152-0	A
21	S1	Switch	00 656.0222-0	B
22		Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
		0.51.0436-1 UNITS SELECT		
1	J	Connector, Plug: 12 Contacts; Female (Amp Inc. 480087-1 or equal)	00 542.1058-0	A
2	P14	Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
3	S1	Switch	00 656.0177-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

ADDRESS SELECT CARD

MODEL NO.

0.51.0435-1 Sh. 2 of 2 Sh.

0

DATE 12 / 20 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1	Capacitor, Fixed, Electrolytic: 22 uf ±20%, 35V (Sprague Type 150D or equal)	00 517.1226-4	A
2	C2	Capacitor, Fixed, Film: 0.1 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.2104-1	A
3	CR1,2	Diode	00 614.0007-0	B
4	Q1,2	Transistor	00 686.0241-0	B
5	R1	Resistor, Fixed, Composition: 1K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0102-0	A
6	R2	Potentiometer: 500 ohms ±5%, 0.6W (Daystrom Type 502-005 or equal)	00 643.3501-4	A
7	R3	Resistor, Fixed, Film: 4.99K ohms ±1%, 1W ±70°C (Int. Resistance Corp. Type CEC or equal)	00 633.4991-0	A
8	R4,6	Potentiometer: 5K ohms ±5%, 0.6W (Daystrom Type 502-005 or equal)	00 643.3502-4	A
9	R5	Resistor, Fixed, Film: 16.5K ohms ±1%, 1W @70°C (Int. Resistance Corp. Type CEC or equal)	00 633.1652-0	A
10	R7	Resistor, Fixed, Film: 54.9K ohms ±1%, 1W @70°C (Int. Resistance Corp. Type CEC or equal)	00 633.5492-0	A
11	R8,10	Potentiometer: 20K ohms ±5%, 0.6W (Daystrom Type 502-005 or equal)	00 643.3203-4	A
12	R9	Resistor, Fixed, Film: 191K ohms ±1%, 1W @70°C (Int. Resistance Corp. Type CEC or equal)	00 633.1913-0	A
13	R11	Resistor, Fixed, Film: 576K ohms ±1%, 1W @70°C (Int. Resistance Corp. Type CEC or equal)	00 633.5763-0	A
14	R12	Resistor, Fixed, Film: 1K ohm ±1%, 1W @70°C (Int. Resistance Corp. Type CEC or equal)	00 633.1001-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

OVERLOAD VOLTMETER CARD

MODEL NO.

0.51.0438 Sh.1 of 2 Sh.

0 DATE 12 / 20 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
15	R14	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0822-0	A
16	R15	Resistor, Fixed, Composition: 15K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0153-0	A
17	R16	Potentiometer: 5K ohms ±30%, 1/2W (Chicago Telephone Supply #45 or equal)	00 643.5502-1	A
18	R17	Resistor, Fixed, Composition: 820 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0821-0	A
19	R18	Resistor, Fixed, Composition: 18K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0183-0	A
20	LS1	Loudspeaker (Mallory SC628 or equal)	00 582.0007-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 12 /20 /68

UNIT TITLE

OVERLOAD VOLTMETER CARD

MODEL NO.

0.51.0438 Sh. 2 of 2 Sh.

APPENDIX 2

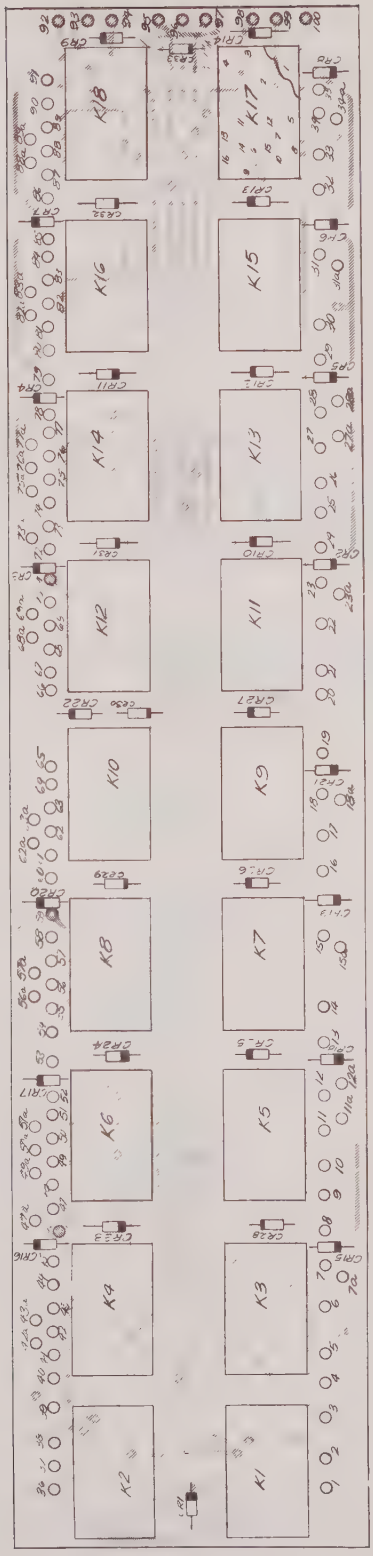
DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

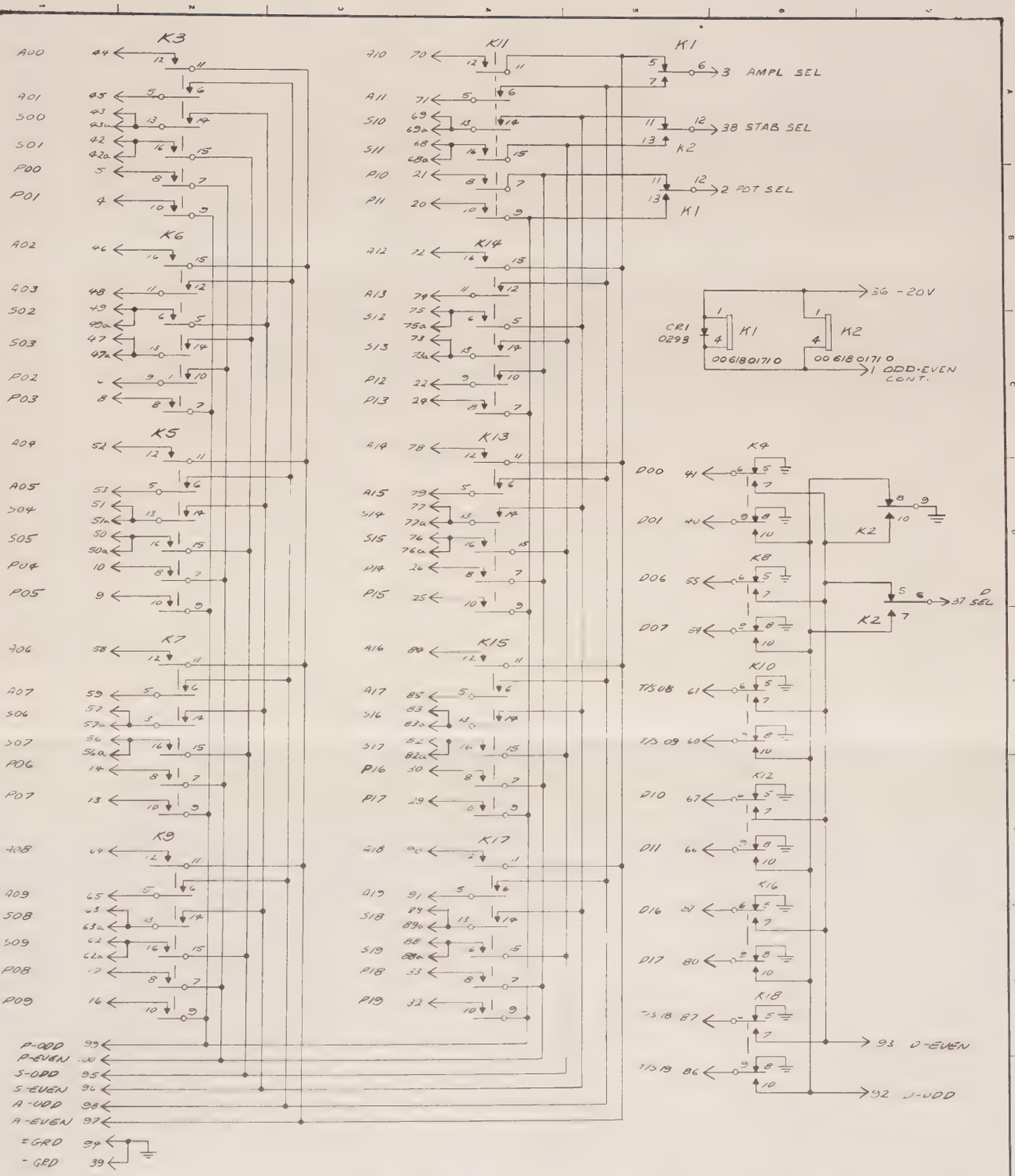
EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

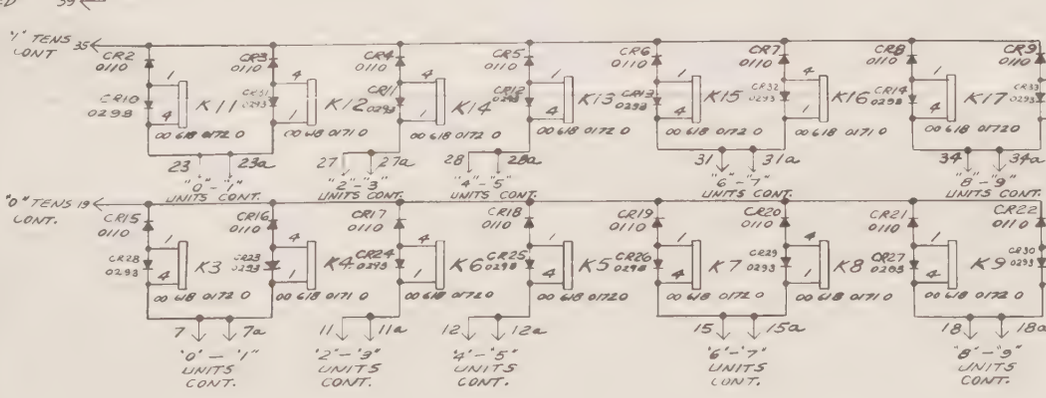
INDEX

Unit or Component	Type of Drawing	Drawing Number
0.12.1720 Select Card 1	Schematic	D00 012 1720 0S
0.12.1721 Select Card 2	Schematic	D00 012 1721 0S
0.20.1235 Analog Panel	Wiring	C00 020 1235 0W (Sheets 2, 3 Only)
0.51.0435 Address Select and Tens Select Card	Schematic	C00 051 0435 0S
0.51.0436 Units Select Card	Schematic	C00 051 0436 0S
0.51.0438 Voltmeter Card	Schematic	D00 020 1235 0S



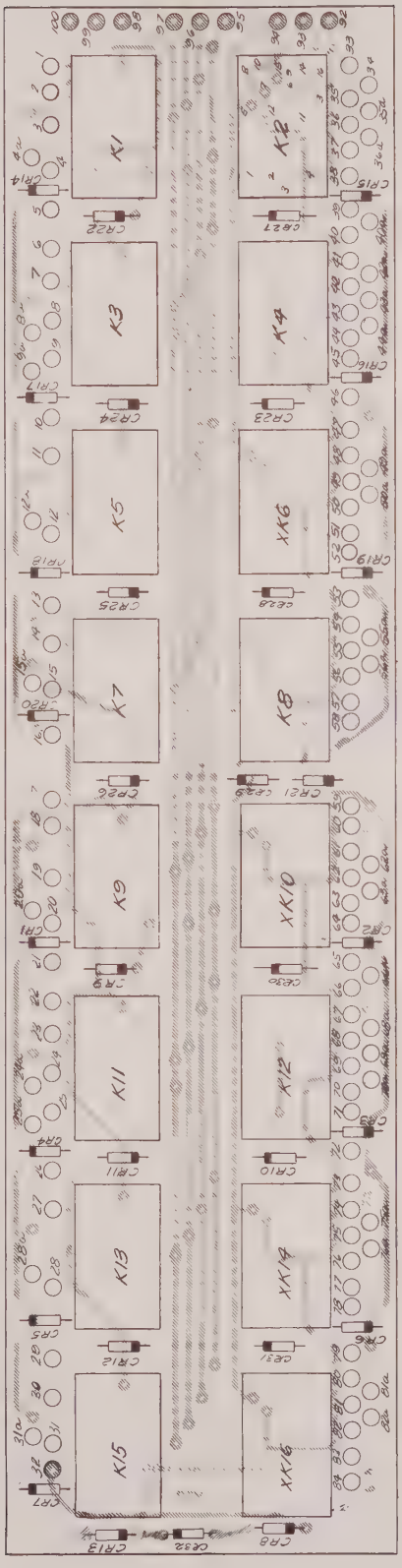
12.1720-0 Select System NW1



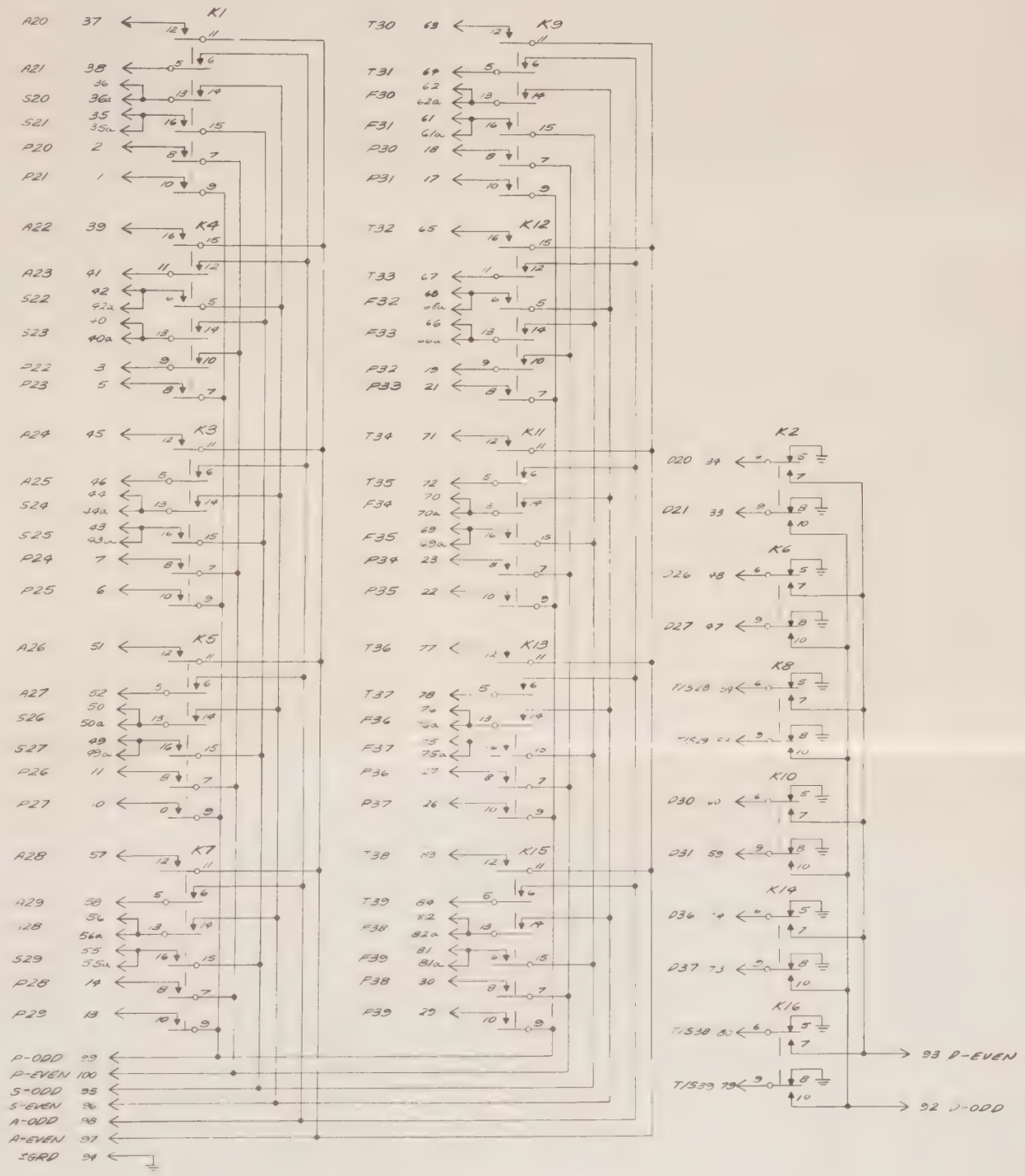

"1" TENS CONT
"0" TENS CONT
"0" - "1" UNITS CONT.
"2" - "3" UNITS CONT.
"4" - "5" UNITS CONT.
"6" - "7" UNITS CONT.
"8" - "9" UNITS CONT.
'0' — '1' UNITS CONT.
'2' - '3' UNITS CONT.
'4' - '5' UNITS CONT.
'6' - '7' UNITS CONT.
'8' - '9' UNITS CONT.

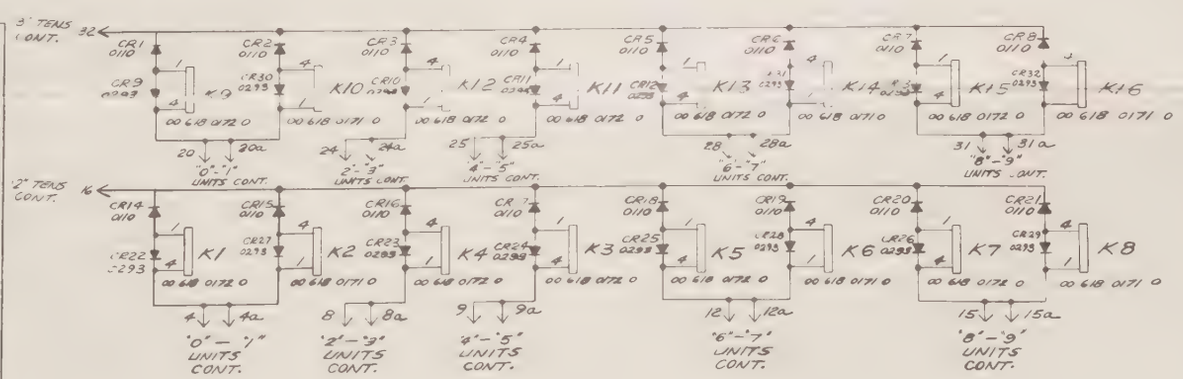
NOTES:
1) ON ALL DIODES, CATEGORY 00 618 XXXX 0 OMITTED DUE TO LACK OF SPACE.

MATERIAL: SEE PARTS LIST A00 012 1720 0P
FINISH
A00 012 1720 0P
A00 012 1720 0P
SCHEMATIC
SELECT SYSTEM (NAV) (PTC-4)
A00 012 1720 05
EAI
C.B 24 THRU C835 WERE NOT SPECD. REVISION: TO REDUCE TRANS. OUT VOLTAGES C8 USING SUBTRACTOR OP-MODES.



12.1721-0 Select System NW2





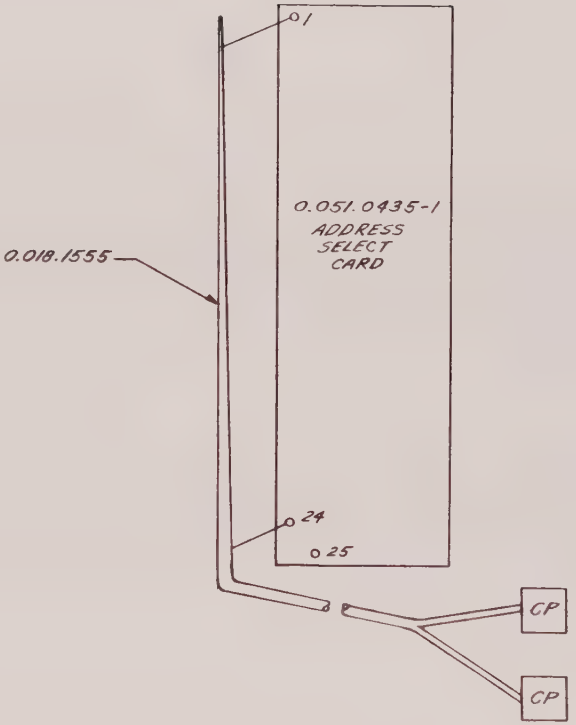
NOTE: (J) ON ALL DIODES, CATEGORY 00 618 XXXX 0 OMITTED DUE TO LACK OF SPACE.

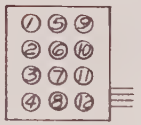
MATERIAL: SEE PARTS LIST
FINISH
4000 012 1721 0P
DWG. NO. 4000 012 1721 0P
SIZE
SHT. NO.
REV. NO.
PROJECT
DWG 012 1721 0P
EAI
SCHEMATIC
SELECT SYSTEM
(NIKE) (PTC-4)

CR27 THRU 4825 MADE NOT SPECIFIED BECAUSE TO REDUCE TRANSIENT VOLTAGE AS CAUSING SHIFT-ING OF MOD 83.

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
2. WIRES AFS # 22 OHU.

AD		CPP3	CPP2	
24	DVM IN	V10	1	
19	PPSEL	GRN	2	
18	FSEL	GRN-RED	3	
22	DSEL	BLU	4	
9	PSEL	WHT-ORN	5	
10	VM(P)	GY	6	
8	ASEL	BLK-YEL	7	
4	TENS "3"	ORN	8	
3	TENS "2"	RED	9	
2	TENS "1"	BRN	10	
1	TENS "0"	BLK	11	
12	D/IO OUT	WHT	12	
17	F FLOOD		WHT-BLU	1
7	-12V OUT		BLU-WHT	2
6	SP BUSS		GRN	3
5	SP MDFG		WHT-GRN	4
15	-20V		GY	5
16	DIG GRD		GY-BLK	6
14	+15V		ORN	7
11	± GRD		BLK	8
13	-15V		V10	9
23	DVM (SW)		WHT-V10	10
25	-20V (SW)		WHT-GY	11



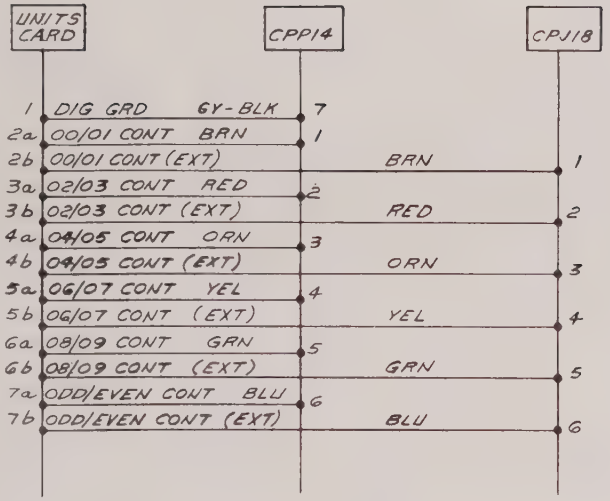


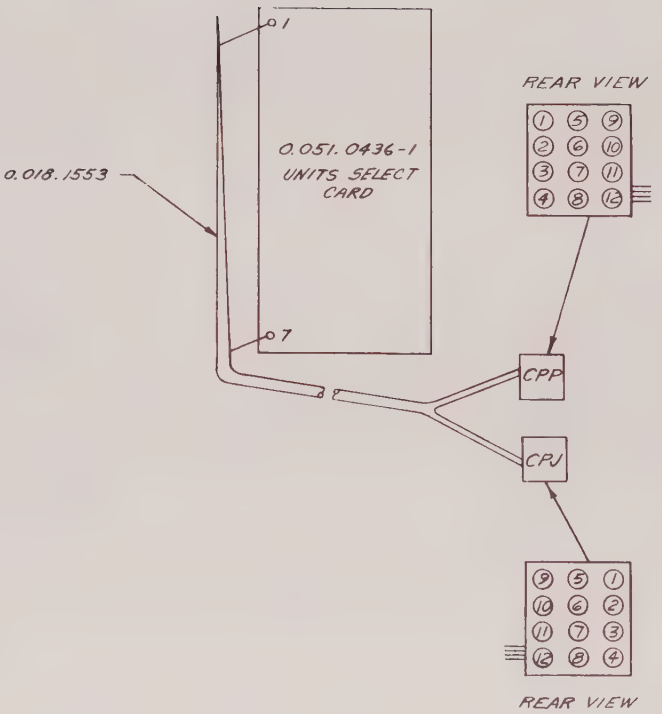
REAR VIEW

MATERIAL:			DWG. NO. MAIN		
FINISH:			USED ON:		
UNLESS OTHERWISE SPECIFIED	SCALE				
DIMENSIONS ARE IN INCHES CAPACITANCE IS IN pf RESISTANCE IS IN OHMS TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.010 .XXX = ±.005 ∠ = ±1° * TOL. OF MATERIAL SUPPLIED	DRAWN	C. BRUNO	DATE 16 SEPT 68	RCDR	DATE
	CHKD		DATE	REVWD	DATE
	DSGR	F.P. Cic H.MILITO	DATE 21 Sept. 68	APPVD	DATE

SHT. NO.	
SIZE	
REV. NO.	
PROJECT 103105	C00 020 1235 0W
SHEET 2 OF SHEETS	

EAI ELECTRONIC ASSOCIATES, INC. Plainview, L.I.


UNITS CARD
CPP14
CPJ18
1 DIG GRD GY-BLK 7
2a 00/01 CONT BRN 1
2b 00/01 CONT (EXT) BRN 1
3a 02/03 CONT RED 2
3b 02/03 CONT (EXT) RED 2
4a 04/05 CONT ORN 3
4b 04/05 CONT (EXT) ORN 3
5a 06/07 CONT YEL 4
5b 06/07 CONT (EXT) YEL 4
6a 08/09 CONT GRN 5
6b 08/09 CONT (EXT) GRN 5
7a ODD/EVEN CONT BLU 6
7b ODD/EVEN CONT (EXT) BLU 6



NO	REVISIONS	APP'D

RELEASED FOR PRODUCTION: ENGR DATE

MATERIAL:

FINISH:

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02
.XXX = ± .010 .XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

DWG. NO. WAS:

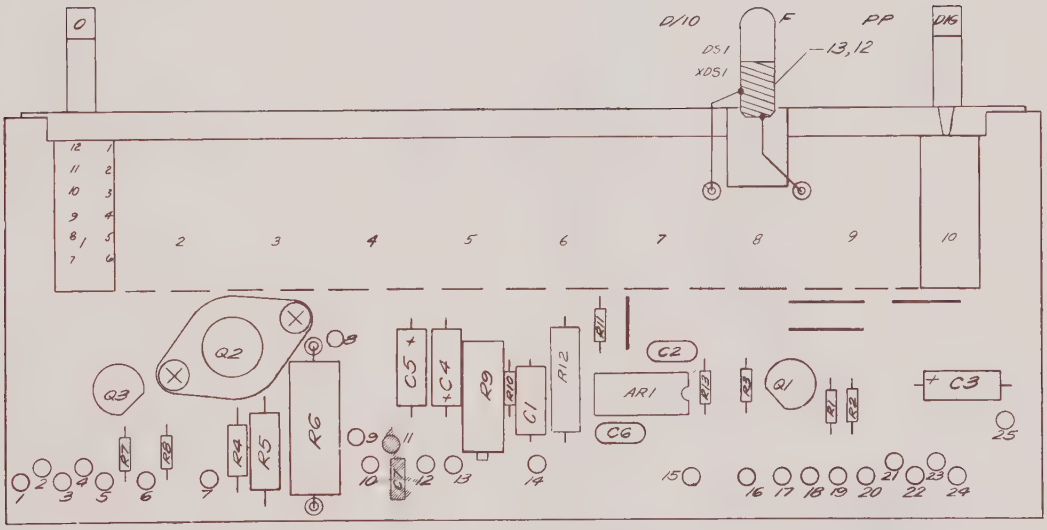
USED ON:

SCALE

DRAWN C. PAULINO	DATE 13 SEPT 68	RCDR	DATE	
CHKD	DATE	REVWD	DATE	
DSGR C. PAULINO 11/26/68	DATE 24 SEPT 68	APPVD	DATE	

EAI: ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SHT. NO.
SIZE
REV. NO.
PROJECT 103105 C00 020 1235 0W
SHEET 3 OF SHEETS



51.0435-0 Address Select

NOTES: (CONT)
2. SWITCH FUNCTIONS "0, 1, 2, 3" ARE INTERLOCKING; SWITCH FUNCTIONS "A, P, D/10, F, PP" ARE INTERLOCKING; SWITCH FUNCTION "DIG" IS PUSH-PUSH.

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a.) ALL RESISTORS ARE ±5%, 1/4 W.
b.) ALL CAPACITORS ARE ±5%, 200V.

DIG PP F D/10 P A 3 2 1 0

S1-10 S1-9 S1-8 S1-7 S1-6 S1-5 S1-4 S1-3 S1-2 S1-1

DVM IN 24
DVM (SW) 23
PP SEL 19
F SEL 18
VM (P) 10
D OUT 20
D SEL 22
D SEL (SW) 21
D/10 OUT 12
P SEL 9
A SEL 8
-20V (SW) 25
TENS "3" 4
TENS "2" 3
TENS "1" 2
TENS "0" 1

-20V

F FLOOD 17
-20V 15
DIG GRD 16
+15V 14
±GRD 11
-15V 13
-12V OUT 7
SP BUSS 6
SP MDFG 5

R1 10K
Q1 C00 686 0325 0
R2 4.7K
R3 4.7K
DS1 (F LIGHT)
C3 6.8 mf ±20% 35V
C7 .01 mf ±20%
C4 6.8 mf ±20% 35V
C5 6.8 mf ±20% 35V
R4 56 1/2W
R5 510 1W
R6 10 5W
Q2 00 686 0310 0
Q3 800 686 0241 0
R7 4.7K
R8 390
C1 .0022 mf ±10%
R12 10K, ±.1% 1W
C2 100pf
R13 1.5K
R9 20K ±10% 1W
R10 3 MEG
R11 10K
153
C6 560pf
+15V
-15V
CW

(a) (b)

MATERIAL:	SEE PARTS LIST A00 051 0435 OP
FINISH:	
DWG NO. WAS:	
USED ON:	A00 051 0435 OP
UNLESS OTHERWISE SPECIFIED	DIMENSIONS ARE IN INCHES; CAPACITANCE IS IN pf; RESISTANCE IS IN OHMS; TOLERANCE OF: .X = ±.03, .XX = ±.02, .XXX = ±.015, .XXX = ±.005, ∠ = ±1°; * TOL. OF MATERIAL SUPPLIED
SCALE	—
DRAWN	C. BRUNO 30 AUG 68
CHKD	J. L. Kell 10 Oct 68
DESN	A.F. Coe A. Mattei 21 Sept 68
RCDR	10/21/68
REVWD	H. Cassidy 19 Oct 68
APPVD	H. Orvilla 21 Oct 68

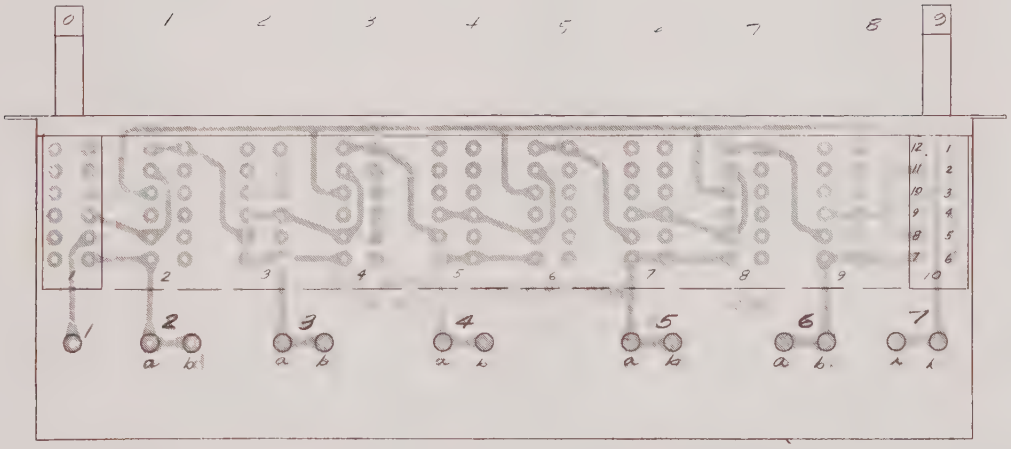
RELEASED FOR PRODUCTION — ENGR. — DATE 10/24/68

NO	REVISIONS	APP'D
L1	C7 WAS NOT SPEC. AREA B-2 20 Sept 68 FPO.	
1	AREA C2: R4 VALUE WAS 110. AREA C-1 R5 VALUE WAS 390. REASON: TO INCREASE THE -12V REGULATION WHEN UNDER FULL LOAD CONDITIONS. 2 April 69 ECO 380-089-0	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC ADDRESS SELECT (PTC-1)

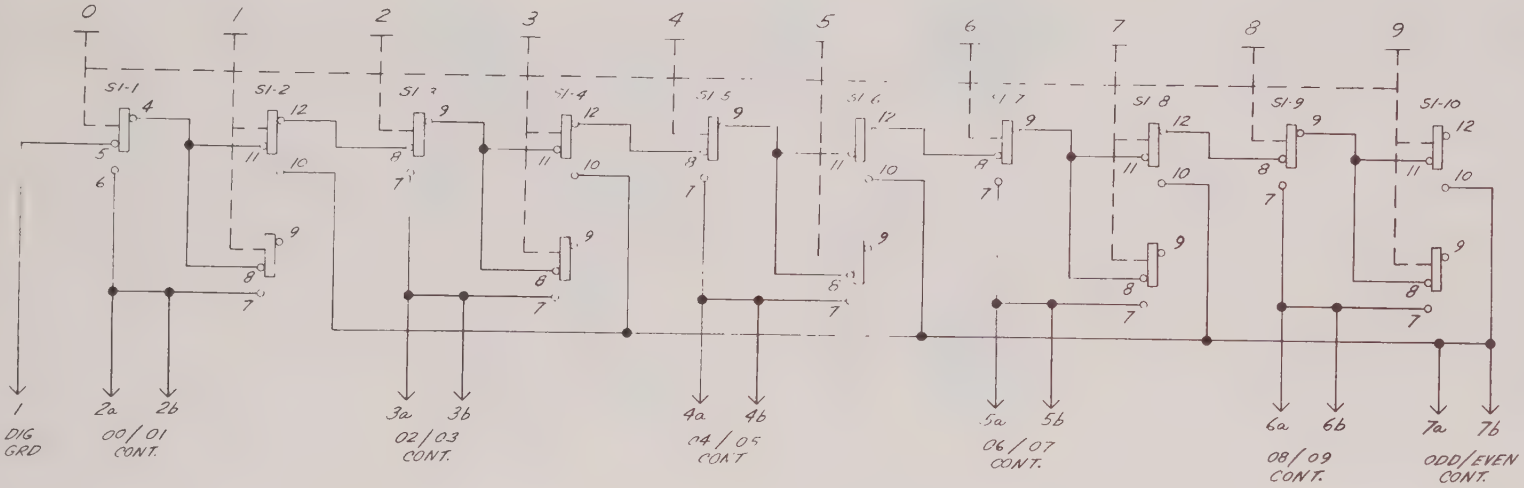
SHT. NO.
SIZE
REV. NO.
PROJECT 103105
C00051043505
SHEET 1 OF 1 SHEETS



51.0436-0 Units Select

NOTES:

1. ALL SWITCH SECTIONS ARE INTERLOCKING.



RELEASED FOR PRODUCTION — DWN — DATE 5 Oct 68

NO	REVISIONS	APPV'D
	(Existing Circuit)	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC
UNITS SELECT
(PTC-1)

SHT. NO.	
SIZE	
REV. NO.	
	C00 051 0436 05

MATERIAL: SEE PARTS LIST A00 051 0436 OP

FINISH: —

DWG. NO. VAR: —

USED ON: A00 051 0436 OP

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

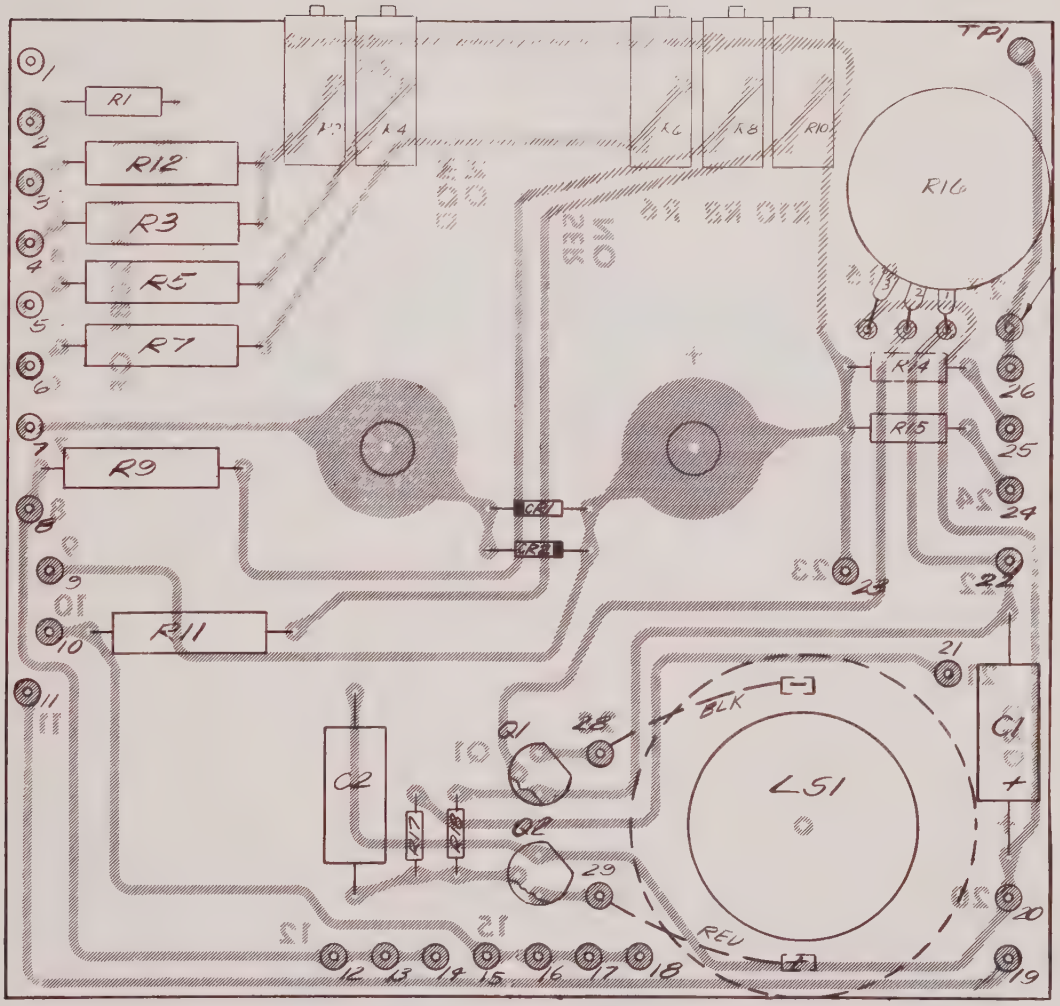
SCALE —

DRAWN Siegrist DATE 5 Sept 68

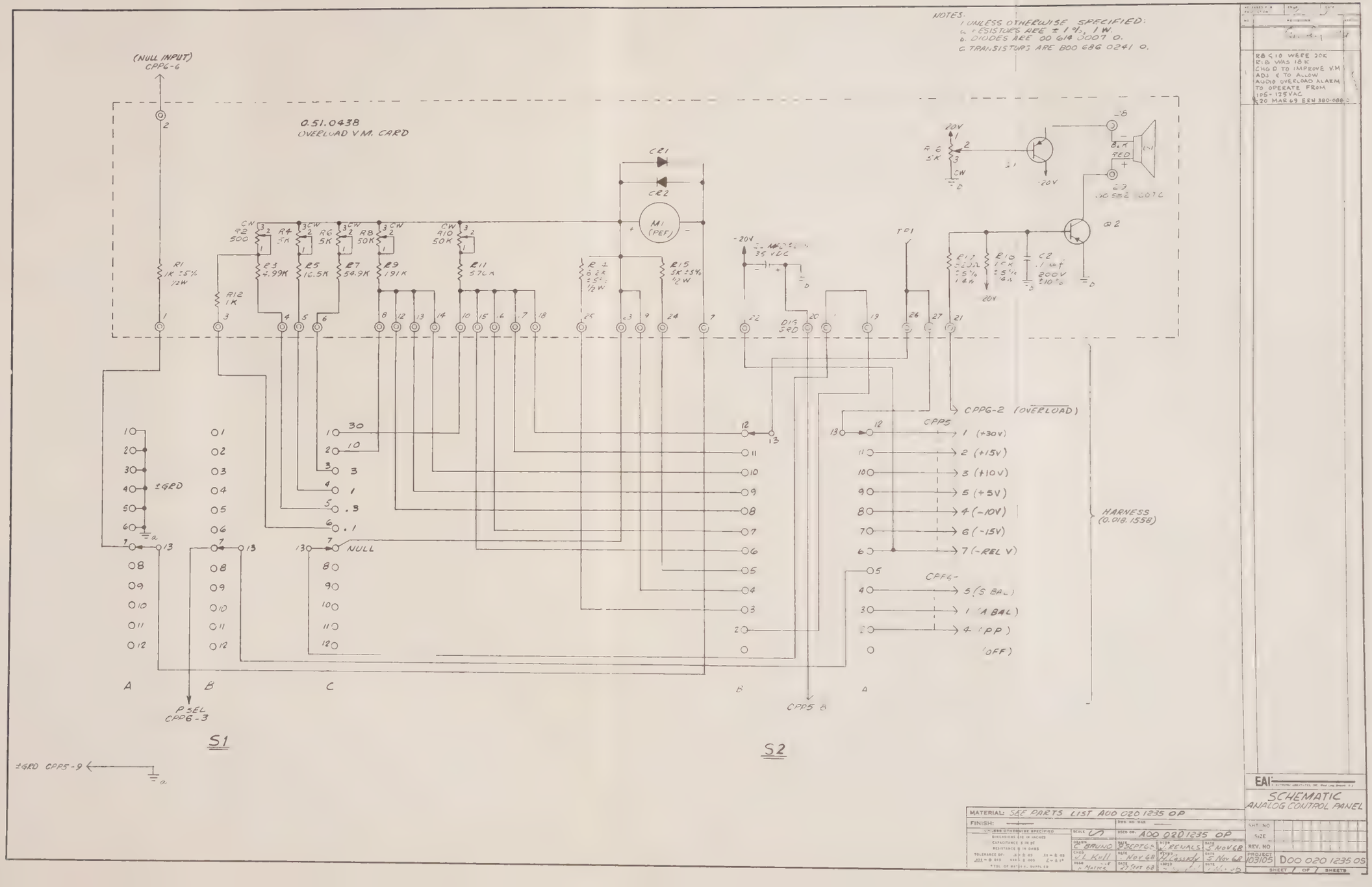
CHKD DATE 14 Oct 68

SCHD DATE

ENGRG DATE



51.0438-0 Overload Voltmeter Card


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a. RESISTORS ARE ± 1%, 1/4 W.
b. DIODES ARE 00 618 0007 0.
c. TRANSISTORS ARE 800 686 0241 0.
(NULL INPUT)
CPP6-6
0.51.0438
OVERLOAD V.M. CARD
CR1
CR2
M1 (PEF)
R1 1K ±5% 1/2W
R2 500
R3 4.99K
R4 5K
R5 16.5K
R6 5K
R7 54.9K
R8 50K
R9 191K
R10 50K
R11 57.6K
R12 1K
R13 6.2K ±5% 1/2W
R15 5K ±5% 1/2W
R16 5K
R17 2.2Ω ±5% 1.4W
R18 1 OHM ±5% 1/4W
C2 .1 mf 200V ±10%
-20V
TP1
Q1
Q2
CPP6-2 (OVERLOAD)
CPP5
1 (+30V)
2 (+15V)
3 (+10V)
5 (+5V)
4 (-10V)
6 (-15V)
7 (-REL V)
CPP6-
5 (S BAL)
1 (A BAL)
4 (PP)
(OFF)
HARNESS (0.010.1558)
±GRD
NULL
P SEL CPP6-3
±GRD CPP5-9
S1
S2
CPP5 B
REVISIONS
RB & 10 WERE 20K
R18 WAS 18K
CHG D TO IMPROVE V.M
ADJ E TO ALLOW
AUDIO OVERLOAD ALARM
TO OPERATE FROM
105-125 VAC
20 MAR 69 ERN 380-088
EAI
SCHEMATIC
ANALOG CONTROL PANEL
MATERIAL: SEE PARTS LIST A00 020 1235 OP
FINISH:
USED ON: A00 020 1235 OP
C. BRUNO 8 SEPT 68
C. KULL 1 NOV 68
P. MATTEK 27 SEPT 68
V. RENALS 5 NOV 68
T. LESSERT 2 NOV 68
PROJECT 103105
D00 020 1235 05
SHEET 1 OF 1 SHEETS

CHAPTER

CHAPTER 5

HANDSET ATTENUATORS

5.1 INTRODUCTION

A fully expanded 380 Computer has a complement of nine (9) quad pot modules (Figure 5.1) for a total of 36 potentiometers. All attenuators have a non-linear resistance in series with the wiper to avoid possible damage to the pot in the event of a patching error. This resistance has a negligible value for ordinary current levels, but increases rapidly as current through the wiper increases, preventing burnout of the winding under excessive loading. The series resistance introduces no error into the circuit, since the pots are set under normal loading thus taking the additional resistance into account.

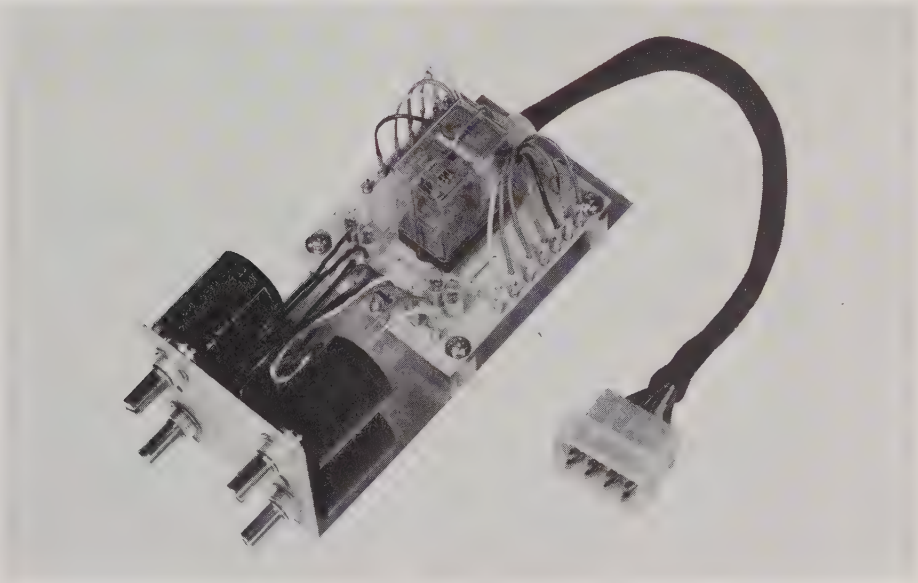


Figure 5.1. Quad Pot Module

The computer is equipped with the necessary controls on the analog control panel for addressing and reading the 36 potentiometers.

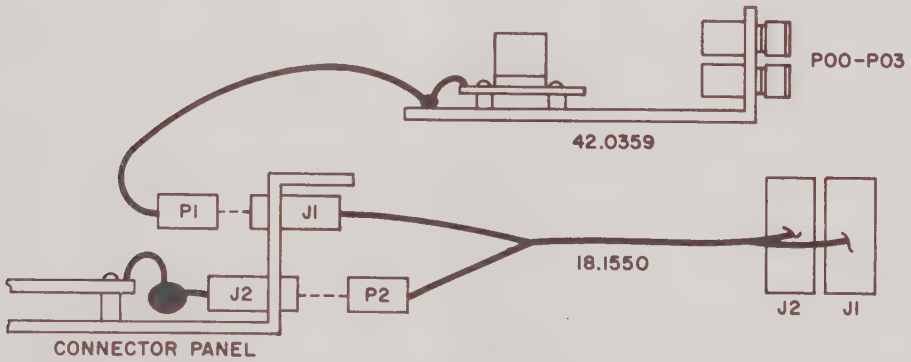
5.2 TECHNICAL DATA

Resistance Value 5k

5.3 INSTALLATION OF QUAD POT MODULE

Installation information for the Quad Pot Modules is shown in Figure 5.2. The quad pot expansion group is made up of a 0.18.1550 harness and a 0.42.0359 pot group. The J1 and J2 patch blocks are secured in the patching area while the J1 and P2 connectors are terminated with their respective mates on the connector panel. The 0.42.0359 Quad Pot Group is inserted into the pot panel from the rear of the computer. The four locking washers and nuts secure the module to the front panel and then the knobs or dials are added. P1 of the 0.42.0359 group plugs into J1 of the 0.18.1550 harness.

The table included in Figure 5.2 shows the attenuator numbers and the connector designations. It should be remembered that Pn plugs into Jn and Pn + 1 into Jn +1.



Attenuator Number	Connector Panel Designation	Attenuator Harness 0.18.1550	0.42.0359 Quad Pot Module
P00 - P03	J1 - J2	J1 - P2	P1
P04 - P07	J3 - J4	J3 - P4	P3
P08 - P11	J5 - J6	J5 - P6	P5
P12 - P15	J7 - J8	J7 - P8	P7
P16 - P19	J9 - J10	J9 - P10	P9
P20 - P23	J11 - J12	J11 - P12	P11
P24 - P27	J13 - J14	J13 - P14	P13
P28 - P31	J15 - J16	J15 - P16	P15
P32 - P35	J17 - J18	J17 - P18	P17

Figure 5.2. Quad Pot Module Installation

5.4 QUAD ATTENUATOR MODULES

The computer readout system energizes relays and connects the DVM to the arm of an addressed attenuator. Two methods of setting the handset pots are given below. To set the pots using a DVM for reading the pot coefficient, proceed as follows:

1. Place the computer in the SP mode.
2. Address the desired pot.
3. Ground the low terminal if necessary.
4. Adjust the knob on the selected pot until the DVM reads out the desired pot coefficient.

This completes the pot setting using a DVM for readout purposes.

If a DVM is not available, the handset pots have to be set using a null voltage method. The procedure for this method is given below.

1. Place the computer in the SP mode.
2. Address the desired pot.
3. Ground the low terminal if necessary.
4. Place the VM FUNCTION switch in the P SEL position.
5. Place the VM RANGE switch in the NULL position.
6. The desired pot and the VM are now connected in the configuration shown in Figure 5.3.
7. Set the NULL Pot for the desired pot coefficient.
8. Adjust the desired pot until the VM nulls (reaches zero).

This completes the null voltage method of setting pot coefficients.

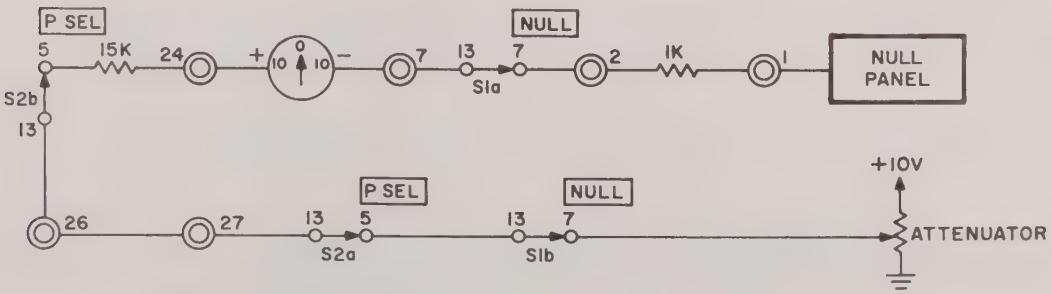


Figure 5.3. Attenuator Null Voltage Circuit

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.42.0359-0 Quad Pot Module	5-7
0.42.0359-1 Quad Pot Module	5-7

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	ATJ1	Connector, Plug: 12 Contacts; Female (Amp Inc. 480087-1 or equal)	00 542.1058-0	A
2	ATP2	Connector, Plug: 12 Contacts; Male (Amp Inc. 480088-1 or equal)	00 542.1059-0	A
3	J1,2	Connector Block	00 542.1012-0	B
4	R1,2,3,4	Potentiometer, Composition: 5K ohms ±30, 1/2W (Chicago Telephone Supply #VA-45 or equal)	00 643.5502-2	A
		0.42.0359-1 QUAD POT MODULE The 0.42.0359-1 Quad Pot Module is identical to the 0.42.0359-0 except for Item 4.		
4	R1,2,3,4	Potentiometer, Wirewound: 5K ohms ±5%, 2W (Bourns Type 3500S or equal)	00 643.4502-1	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

QUAD POT MODULE

MODEL NO.

0.42.0359-0 Sh.1 of 1 Sh.

0 DATE 12 / 20 /68

APPENDIX 2

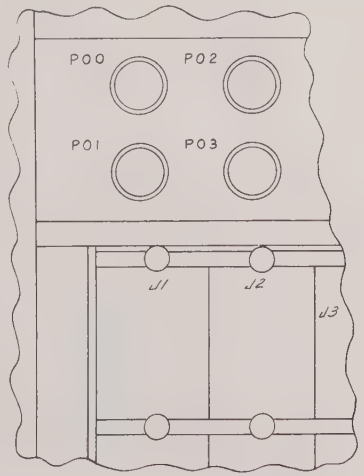
DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

INDEX

Unit or Component	Type of Drawing	Drawing Number
0.2.1376 Quad Pot Expansion	Assembly, Information	C00 002 1376 0A D00 002 1376 0H (Sheets 1, 2)
0.42.0359 Quad Pot Module	Assembly W/Wiring Schematic	C00 042 0359 0A C00 042 0359 0S



FRONT VIEW

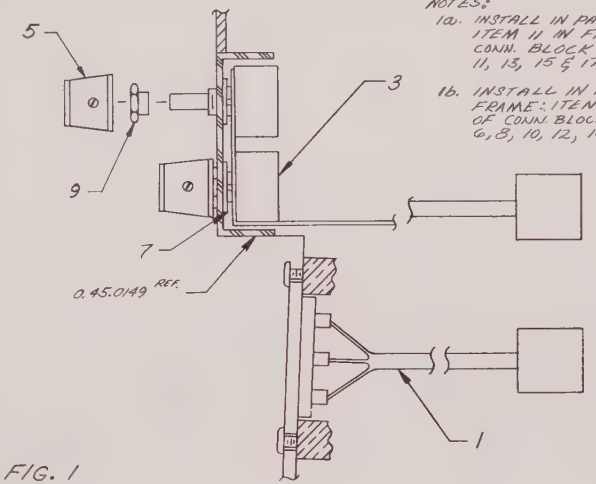
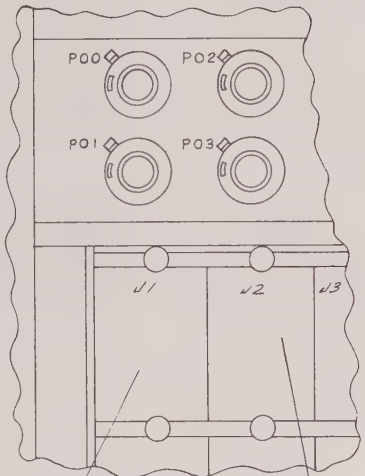


FIG. 1



FRONT VIEW

SEE NOTE 1a

SEE NOTE 1b

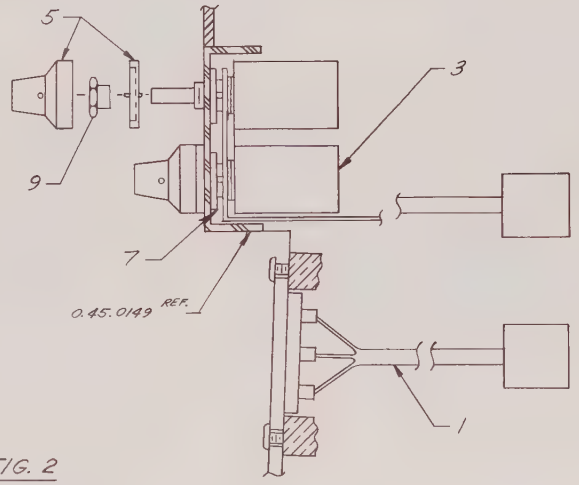


FIG. 2

NOTES:

1a. INSTALL IN PATCH BAY FRAME: ITEM 11 IN FRONT OF CONN. BLOCK J1, 3, 5, 7, 9, 11, 13, 15 & 17.

1b. INSTALL IN PATCH BAY FRAME: ITEM 10 IN FRONT OF CONN. BLOCK J2, 4, 6, 8, 10, 12, 14, 16 & 18.

NO.	REVISIONS	APP'D
1	NOTES 1a & 1b WERE NOT CHECKED	

RELEASED FOR PRODUCTION: DATE 7 Nov 68

UNIT NUMBER	ASSEMBLY NUMBER	PARTS LIST & NEXT ASSY	DESCRIPTION	PARTS LIST USED ON	PROJECT NUMBER
0.2.1376-1	00 2.1376 1A	00 002 1376 1P	AS SHOWN, FIG. 2	00 045 0149 0P	103/105
0.2.1376	C00 002 1376 0A	A00 002 1376 0P	AS SHOWN, FIG. 1	A00 045 0149 0P	103/105

TABLE OF UNIT NUMBERS

MATERIAL: SEE TABLE OF UNIT NUMBERS

FINISH:

DWG. NO. WAS:

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: X = ±.03 .XX = ±.02 .XXX = ±.010 .XXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED

SCALE

SHOWN ON: SEE TABLE

DRAWN	F.R.Cue	DATE 12 Oct 68	RCDR	DATE
CHKD	J.L.Kull	DATE 7 Nov 68	REVWD	DATE
DSGR	F.A.Cue of Matter	DATE 12 Oct 68	APPRD	DATE

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

ASSEMBLY
QUAD POT EXPANSION
(330)

SHT. NO.

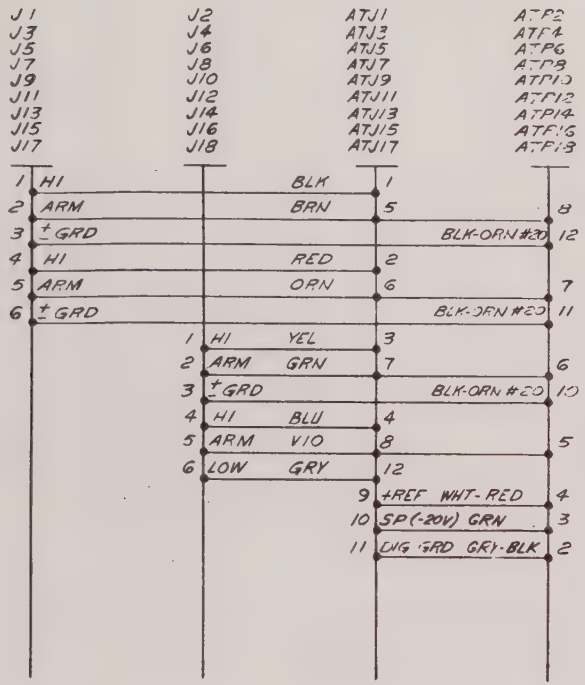
SIZE

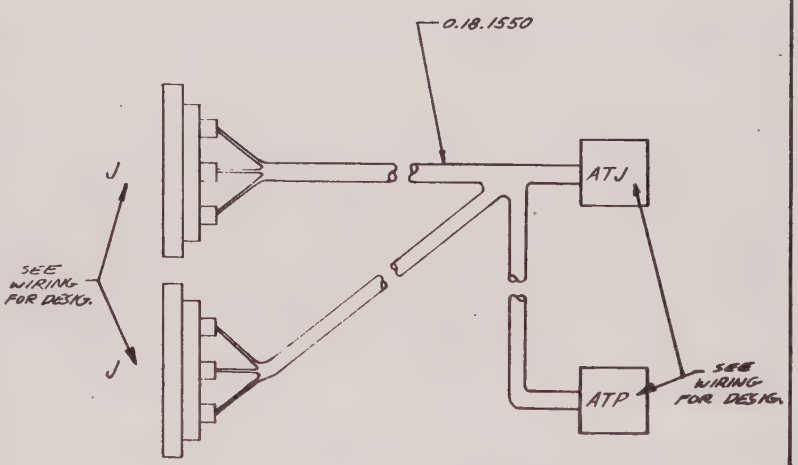
REV. NO.

PROJECT 103/105

C00 002 1376 0A

SHEET 1 OF 1 SHEETS

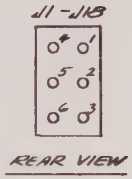


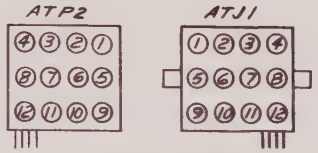


WIRING INFORMATION

NOTES:

1) UNLESS OTHERWISE SPECIFIED ALL WIRES TO BE #22 AWG.



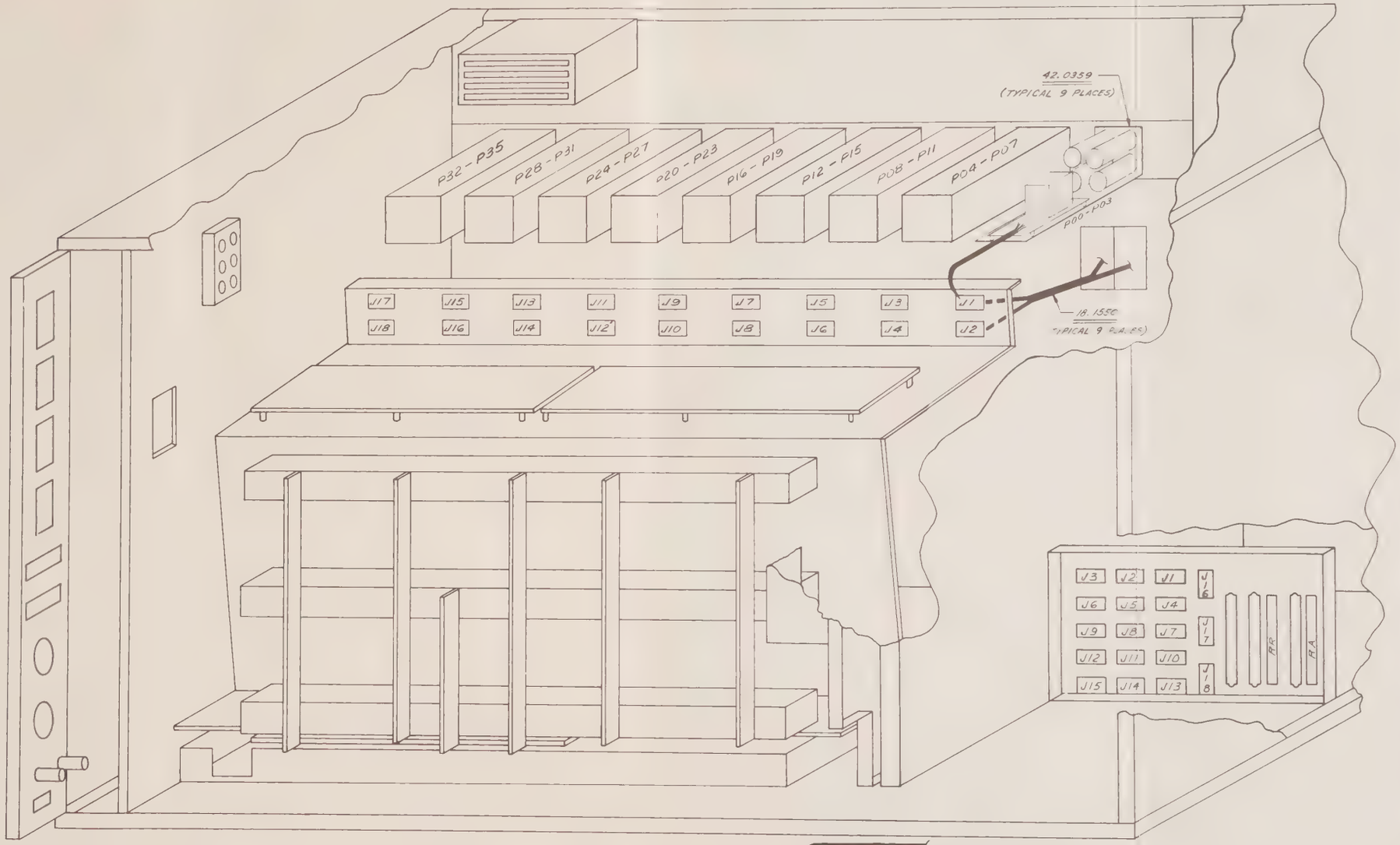


INFORMATION QUAD POT EXPANSION (380)

MATERIAL: SEE PARTS LIST A00 002 1376 OP

FINISH:

A00 002 1376 OP



MATERIAL:

FINISH

EAI

SHT NO

SIZE

REV NO

DRAWN

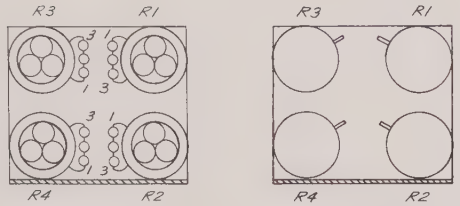
CHK'D

APPROVED

DRAWING NO. D00 002 1376 04

SHEET 2 OF SHEETS

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
a. WIRES ARE #22 PHU.



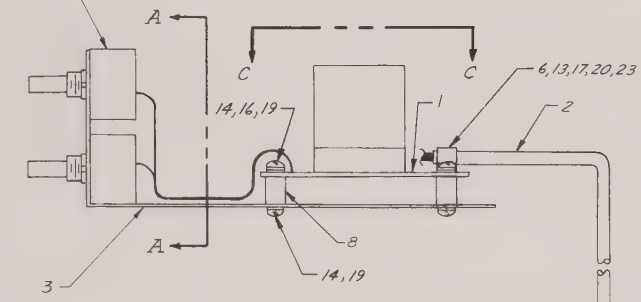
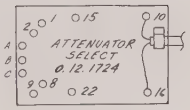
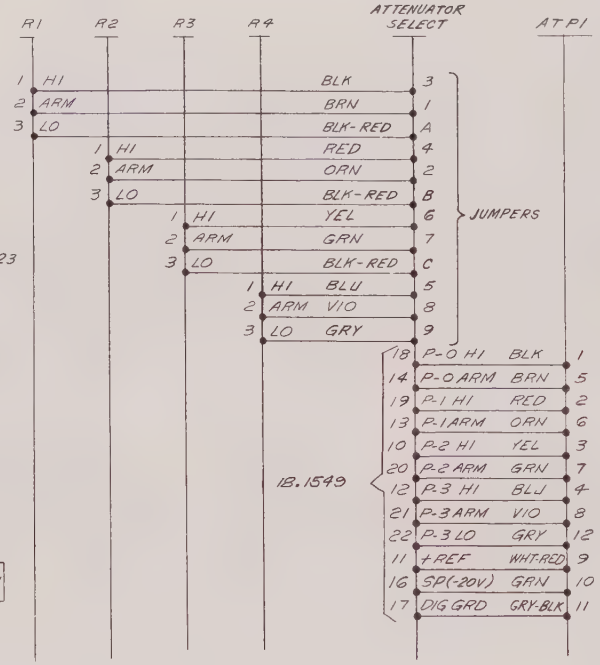


FIG. 1





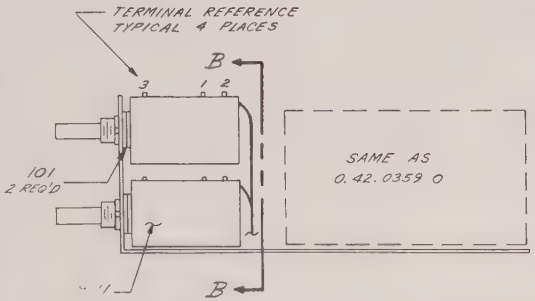


FIG. 2

UNIT NUMBER	ASSEMBLY NUMBER	PARTS LIST & NEXT ASSY.	DESCRIPTION	PARTS LIST USED ON	PROJECT NUMBER
0.42.0359-/	C00 042 0359 1A	C00 042 0359 1P	AS SHOWN, FIG. 2	A00 002 1376 1P	103105
0.42.0359	C00 042 0359 0A	A00 042 0359 0P	AS SHOWN, FIG. 1	A00 002 1376 0P	103105

TABLE OF UNIT NUMBERS

MATERIAL: SEE TABLE OF UNIT NUMBERS
FINISH:
DWG. NO. WAS:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ±.03 .XX = ±.02 .XXX = ±.015 .XXXX = ±.005 ∠ = ±1°
* TOL. OF MATERIAL SUPPLIED
SCALE 1/1
USED ON: SEE TABLE
DRAWN C. BRUNO DATE 16 SEPT 68
CHKD J. L. Krull DATE 7 NOV 68
DSGR F. P. Cue / W. Mattei DATE 28 SEPT 68
RCD'D DATE 11/14/68
REVD W. Cassidy DATE 12 Nov. 68
APP'D A. Novotni DATE 13 Nov 68

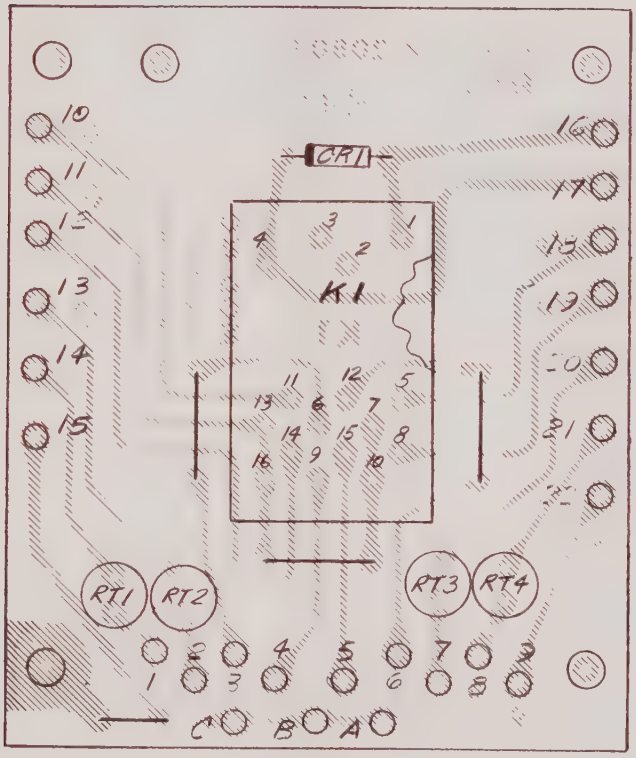
RELEASED FOR PRODUCTION — ENGR N/A — DATE 8 Nov. 68

NO	REVISIONS	APP'VD
1	AREA C-8: IN SECT. A-A R1 THRU R4, TERMINALS 1 & 3 WERE REVERSED 13 MAR 69 ERN 380-079-0	

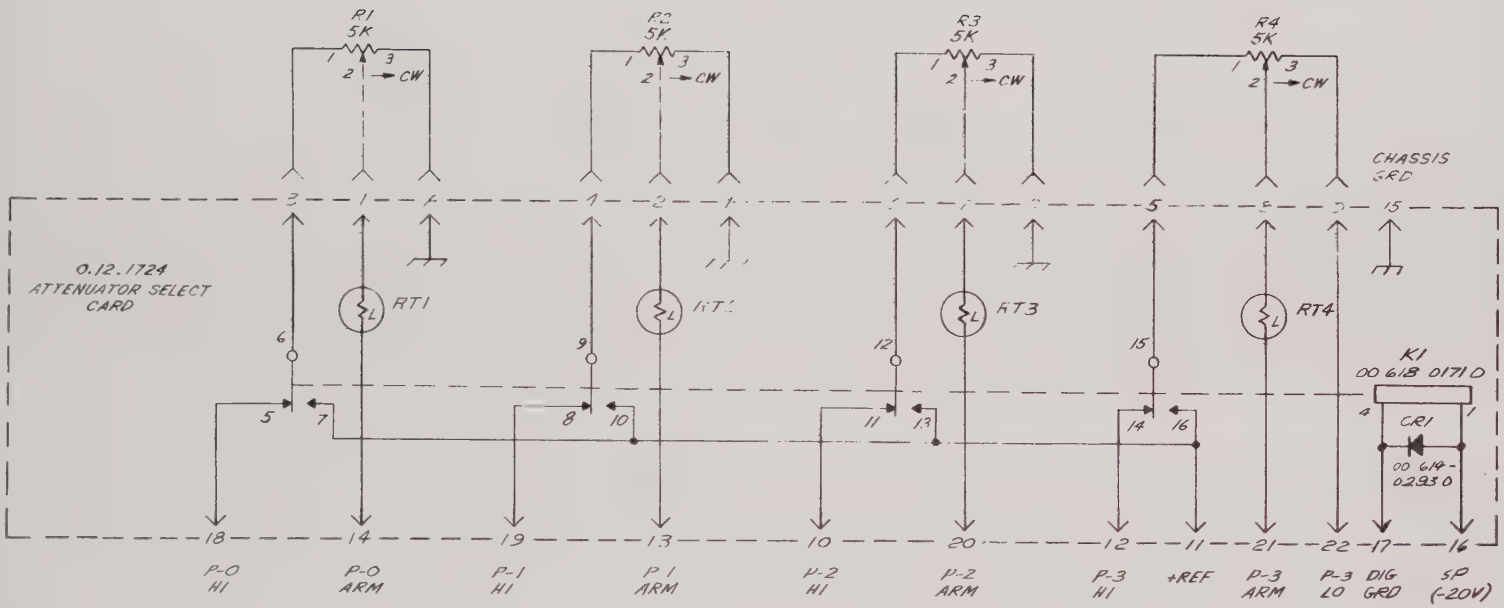
EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

ASSEMBLY/WIRING QUAD POT MODULE

SHT. NO.
SIZE
REV. NO.
PROJECT 103105
C00 042 0359 0A
SHEET 1 OF 1 SHEETS



12.1724-0 Attenuator Select



REVISIONS			
NO.			APP'D
PRODUCTION			

MATERIAL: SEE PARTS LIST A00 042 0359 OP

FINISH: —

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
TOLERANCE OF: .X = ± .03 .XX = ± .01 .XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

SCALE —

DRAWN C. BRUNO — DATE 2 SEPT 68
CHKD J. L. Kull — DATE 7 Nov 68
DSGR F.A.C., H. Harris — DATE 26 Sept. 68

DWG. NO. BASE —
USED ON A00 042 0359 OP

RELEASED — DATE 7/12/68
REVISED — DATE 13 Nov 68
APP'D — DATE 7 Nov 68

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC
QUAD POT MODULE
(380)

SHT. NO.
SIZE
REV. NO.
PROJECT 103105
C00 042 0359 OS
SHEET 1 OF 1 SHEETS

CHAPTER

6

CHAPTER 6

OVERLOAD INDICATORS

6.1 INTRODUCTION

The 380 is equipped with an overload warning system that provides both visual and audible indication of component overloads. The visual overload indicator panel (Figure 6.1) is equipped with lamps that illuminate the least significant address digit of any overloaded amplifier, including the plus and minus reference amplifiers. The audible alarm produces a tone whenever any of the visual indicator lamps is illuminated. In addition to these indications of an overload, a logic signal connected to the OVD patch terminal goes high when an overload occurs. This signal may be patched to an Override Hold (ORH) terminal, forcing the integrators into *hold* when a component overloads; or patched to an Overload Store (OLS) terminal, causing the indicator to remain illuminated after the overload is removed.

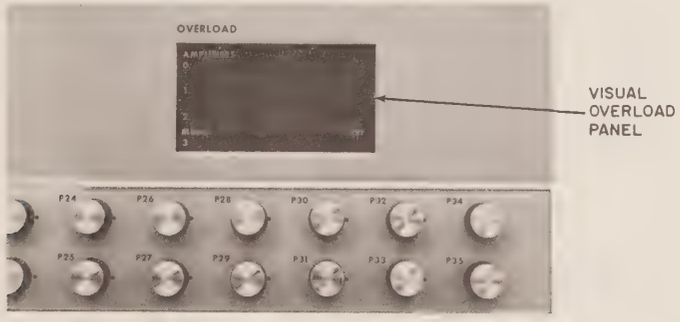


Figure 6.1. Visual Overload Panel

6.2 THEORY OF OPERATION

6.2.1 Visual Overload Indicators

A simplified schematic of an amplifier overload indicator circuit connected to an amplifier stabilizer output is shown in the left center portion of Figure 6.2. The pulsating stabilizer output signal normally has a very low amplitude. If an amplifier overloads, the stabilizer output signal increases greatly in amplitude. Capacitor C1 couples this signal to the cathode gate of silicon-controlled switch (SCS) Q1. The SCS then allows current to flow through the overload indicator lamp, DS1.

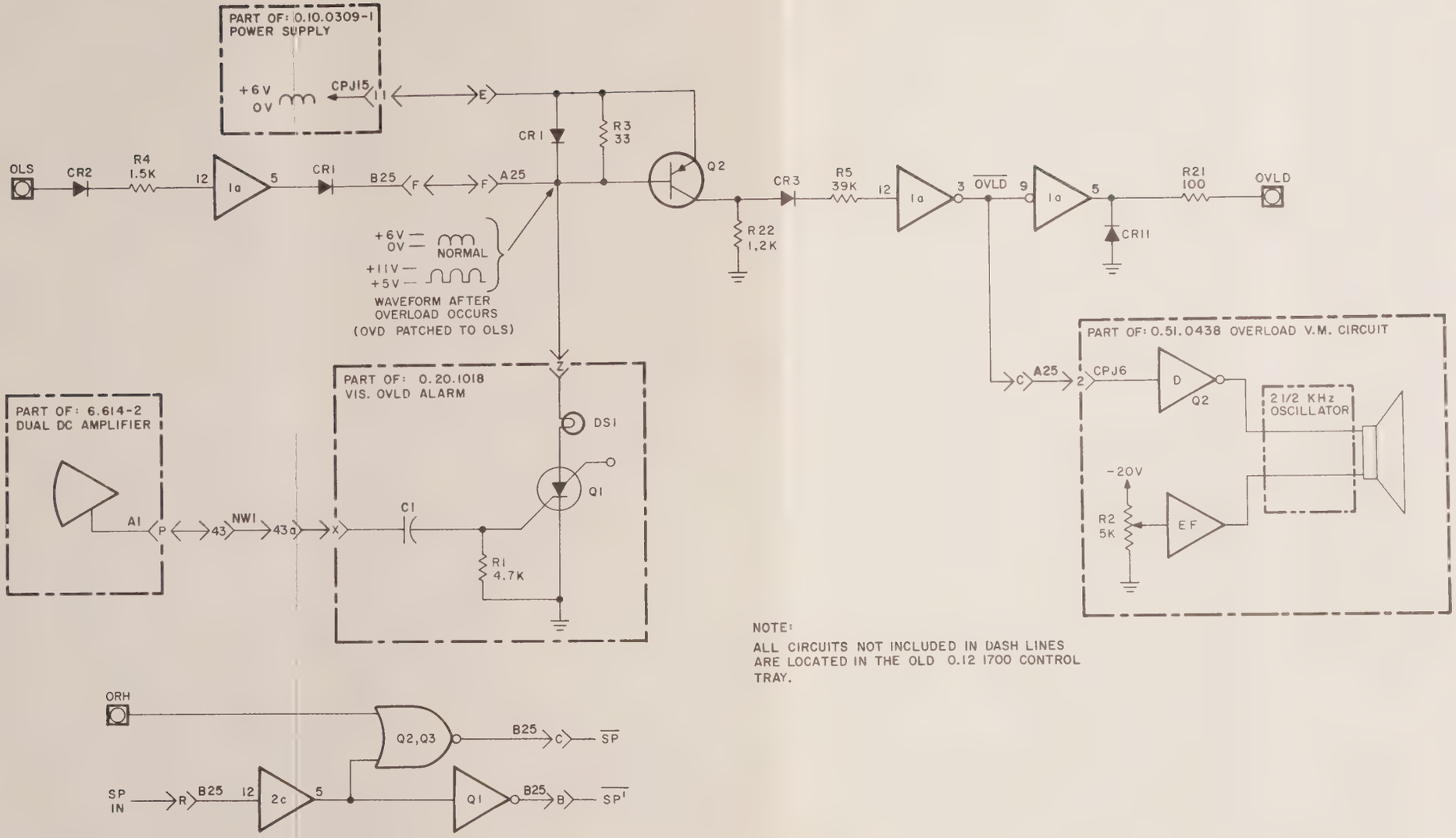


Figure 6.2.
Typical Overload Alarm Circuit

Once an SCS begins conducting, it remains conducting until the anode-to-cathode potential is removed. Thus, if power for the lamps were supplied from a filtered dc source, the lamps would remain illuminated indefinitely once an overload occurred. For this reason, the overload lamp power is supplied from a rectified but *unfiltered* source, except when the OVD terminal is patched to the OLS terminal. The voltage thus decreases to zero 120 times per second (assuming a 60 cps primary supply frequency), and the lamps are extinguished almost immediately after an overload is removed. This type of circuit is used to monitor all stabilized amplifiers in the computer. Ten circuits identical with that shown in Figure 6.2 are mounted on a 20.1018-4 Visual Overload Alarm etched-circuit card. The indicator lamps are mounted on the edge of the card, which is installed directly behind the overload indicator panel. A metal mask directs the light from illuminated lamps to the appropriate numbers on the panel.

The overload indicator circuits for the encapsulated MDFG amplifier (which are not chopper-stabilized), are shown in Figure 6.3. The input signal to an overload circuit of this type may be slowly changing dc level, rather than a pulsating signal. For this reason, resistive rather than capacitive coupling is employed in the circuit. The MDFG units are equipped with overload level detection circuits that provide an amplified signal to the indicator network when an overload occurs.

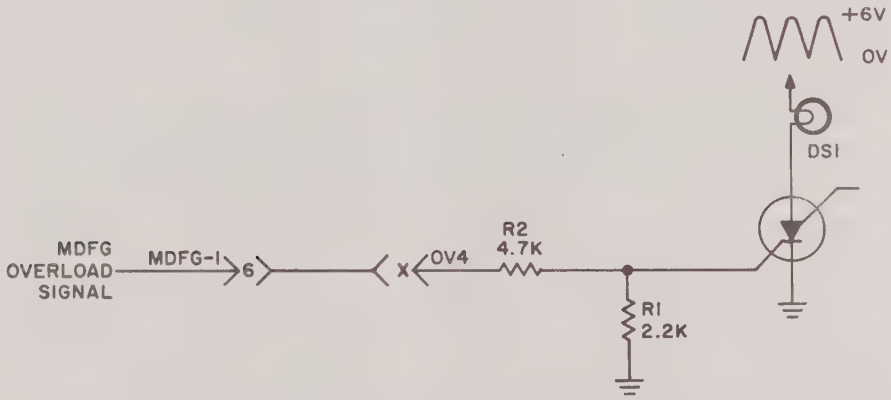


Figure 6.3. MDFG Overload Indicator Circuit, Model 0.26.0294

Figure 6.4 illustrates the overload detection circuit for an MDFG unit. Each MDFG unit has a pair of amplifiers (AR1 and AR2). The detection circuit uses a cascaded inverter network to sense an overload of either polarity. For example, if the output of either AR1 or AR2 exceeds about +11.5 volts, Q1 becomes forward biased. The low from the collector of Q1 reverse biases Q2, and the collector of Q2 goes positive. Conversely, if the output of either AR1 or AR2 goes more negative than about -11.5 volts, one of the diodes connected through the 13k resistor to the base of Q2 reverse biases the transistor. In either case, the collector of Q2 goes positive, and the SCS on the 0.26.0294 Visual Overload Alarm card is triggered, causing the associated lamp to light.

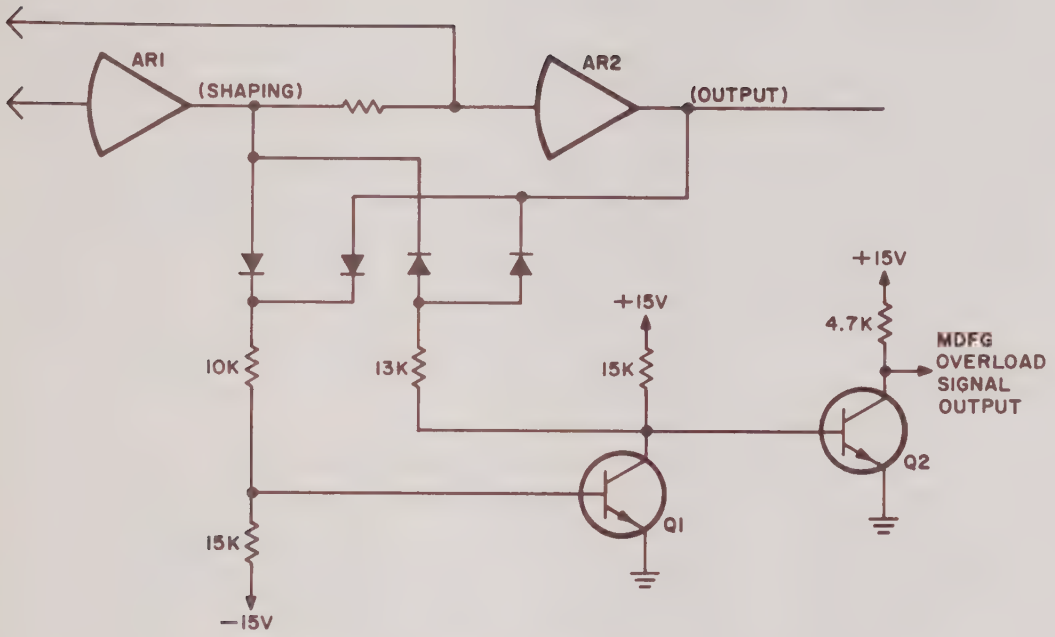


Figure 6.4. MDFG Overload Detection Circuit

The third variation of the overload indicator circuit (0.26.0294) is shown in Figure 6.5. This circuit indicates an overload in the positive or negative reference supply. This circuit is identical with the circuit for the other stabilized amplifiers (0.20.1018), except that a 27k series resistor (R2) is connected in series with the input to reduce short term noise transients. Two identical circuits are mounted on the card, one for each reference amplifier.

6.2.2 Audible Overload Alarm

The audible overload alarm consists of an oscillator and a loudspeaker, mounted on the analog control panel. A logic circuit, located in the 0.12.1700 Control Tray, inhibits the oscillator, except when one or more visual indicator lamps is illuminated.

The audible overload alarm, together with its logic control circuitry, is shown in Figure 6.2. When an overload occurs, Q1 of the visual overload alarm conducts, grounding the +6 volts from the power supply through Diode CR1. The base of Q2 becomes more negative than its emitter, the transistor conducts and its collector and the input of Inverter 1a (Pin 12) go high. With its input high, the output of Inverter 1a (Pin 3) goes low, and Transistor Q2, located in the 0.51.0438 Overload Card, conducts. The conduction of Q2 provides a ground path for the encapsulated oscillator circuit (located on the 0.51.0438 Overload Card), the oscillator starts and the alarm sounds. Adjustment of Potentiometer R2 varies the audible output of the unit from zero to maximum value.

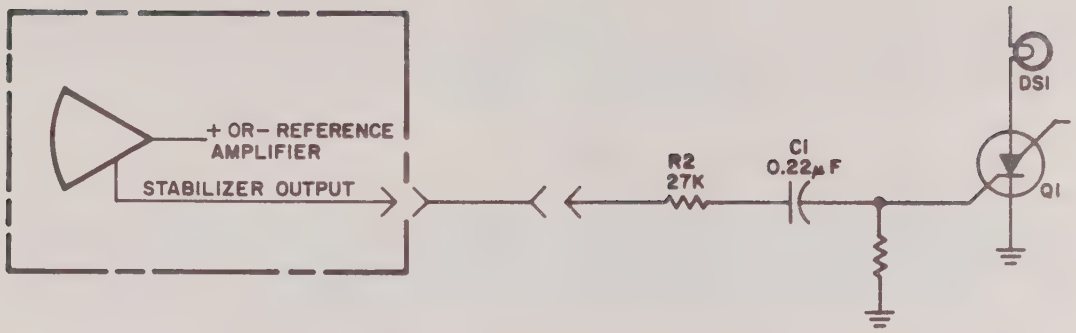


Figure 6.5. Reference Amplifier Overload Circuit, Model 0.26.0294, Simplified Schematic

When the audible overload alarm is heard, the operator can check the visual overload indicator panel to determine which component (or components) is overloaded, and correct the problem. However, some overloads may be of a transient nature when a high-speed problem is on the computer. In these cases it is difficult to locate visually the overloaded component. Therefore, the collector of Q2 (which goes high during an overload) is connected through a buffer stage to the patch panel, and can be used to force the computer instantly into the *hold* mode when an overload occurs, or to store a transient overload. Figure 6.2 illustrates the circuits that provide the automatic *hold* or overload store functions. If the OVD terminal is patched to the OLS terminal, the output of the 1a buffer circuit goes high when an overload occurs. This high output is added to the +6 volt peak unfiltered supply voltage for the indicator lamps. The voltage no longer drops to zero at a 120 cps rate, but appears as shown in Figure 6.2. The conducting SCS thus remains conducting after the overload is removed, and the indicator remains illuminated.

When an overload is cleared, the patching connection between the OVD and OLS terminals must be momentarily removed to clear the indication.

If the OVD terminal is patched to the ORH terminal, the output of the Q2, Q3 NOR gate goes low when an overload occurs. This low output, designated $\overline{SP}$, forces all integrators into the *hold* mode. Since the problem is stopped at the point where the overload occurred, the overload indicator for the overloaded component remains illuminated, and the operator can check the input and output parameters for this component to determine the cause of the overloaded condition. However, if any of the inputs causing the overload are removed for checking, the overload disappears, and the computer resumes operation. For this reason, the manual HD pushbutton on the analog control panel should be depressed, forcing the computer mode control circuits into the *hold* mode. If this is done, the circuit can be checked by removing patch cords, etc., and the computer cannot resume normal operation until the overload is cleared and the OP pushbutton is depressed.

The OVD terminal may also be used to accomplish some other function, if desired, by patching the OVD output through a differentiator to a logic component.

6.3 MAINTENANCE AND TROUBLESHOOTING

None of the overload warning circuits require periodic maintenance or adjustments. It is normal for the visual indicators to flicker when the computer is first switched on. After 15 to 30 seconds, all visual indicators should be extinguished and the audible alarm should stop.

If none of the indicator lamps light during the computer warm-up, check fuse F8 on the 0.10.0309-1 Power Supply. If it is desired to check all indicator lamps individually, remove the patch panel and place the computer in the *IC* mode. The indicator lamps for all the amplifiers in the computer should light.

The MDFG overload indicators may be checked by placing the slope switch for Segments 1 and 2 of each MDFG unit in the +SL position, setting the BP potentiometers for these segments fully counter-clockwise, and setting the SL potentiometers for these segments fully clockwise. It is now necessary to patch the MDFG X input to reference voltage of the proper polarity (+ reference for +MDFG units, - reference for -MDFG units) to cause the overload indicator to light. Repeat this test for all MDFG overload indicators in the computer.

If any of these tests do not cause the appropriate indicator to light, remove the overload indicator panel and the metal mask to expose the card on which the lamp is mounted. The card can now be removed by pulling it forward. When the card is removed, the lamp can be checked with an ohmmeter. If the lamp appears to be good, check the SCS by substitution.

If the audio alarm fails to operate when a visual indicator is illuminated, first ensure that the volume control is not at its minimum setting. Then check the OVD terminal. If this terminal is high, the trouble is in the oscillator circuit. If this terminal is low, check Pin CPJ6-2 on the 0.20.1235 Analog Control Panel with an oscilloscope. The signal at this point should be a negative-going, full-wave rectified voltage with a peak amplitude of between -0.5 and -1.0 volt when an overload is present. If this signal does not appear, check the wiring as shown in Figure 6.2. If this signal is present, use point-to-point signal tracing to locate the faulty component.

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.12.1700 Control Tray	3-30
0.12.1616 Control Card 2	3-31
0.12.1722 Control Card 1	3-32
0.20.1018-4 Visual Overload Alarm	6-9
0.26.0294-0 MDFG and Ref Overload Indicator Card	6-10
0.51.0438-0 Overload Voltmeter Card	4-14

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1	Capacitor, Fixed, Plastic: 0.22 uf ±20%, 50V (Goodeman Type 363 or equal)	00 521.1398-0	A
2	C2	Capacitor, Fixed, Ceramic: 0.047 uf ±20%, 25V (Sprague Type 3C or equal)	00 511.5473-4	A
3	DS1	Lamp	00 578.0077-0	B
4	Q1	Thyristor	00 648.0036-0	B
5	R1	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0272-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

VISUAL OVERLOAD ALARM

MODEL NO.

0.20.1018-4 Sh. 1 of 1 Sh.

9

DATE 12 / 20 /68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1-()	Capacitor, Fixed, Film: 0.1 uf ±10%, 200V (Sprague Type 192P or equal)	00 522.2104-1	A
2	C2-()	Capacitor, Fixed, Ceramic: 0.047 uf ±20%, 25V (Sprague Type 3C or equal)	00 511.5473-4	A
3	DS1-()	Lamp	00 578.0077-0	B
4	Q1-()	Silicon Controlled Switch: 3N84	00 648.0016-0	A
5	R1-()	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
6	R2-()	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0222-0	A
7	R3-()	Resistor, Fixed, Composition: 27K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0273-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
MDFG AND REF OVERLOAD INDICATOR CARD

MODEL NO.
0.26.0294-0 Sh. 1 of 1 Sh.

0

DATE 12 / 20 / 68

M446

APPENDIX 2

DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

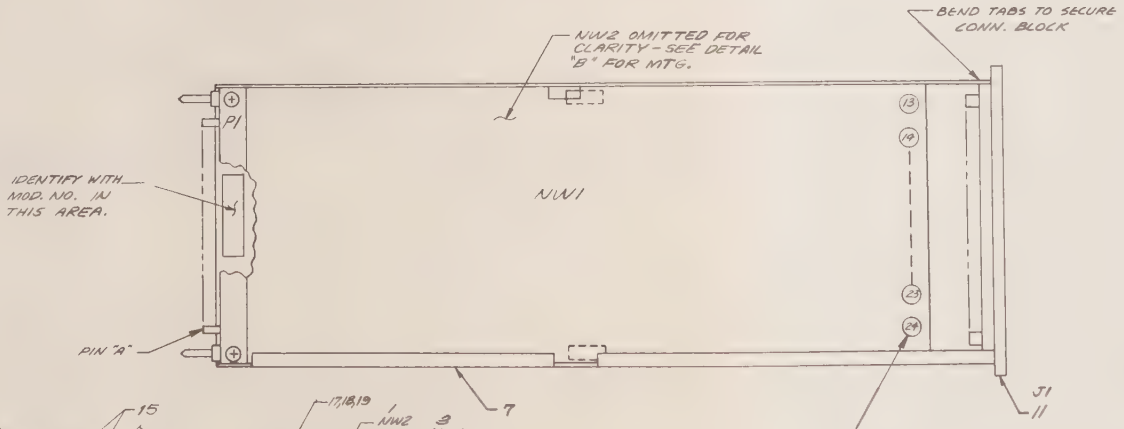
INDEX

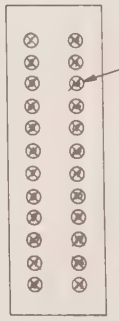
Unit or Component	Type of Drawing	Drawing Number
0.12.1700 Control Tray	Assembly W/Wiring	D00 012 1700 0A
0.12.1722 Control Card 1	Schematic	C00 012 1722 0S
0.12.1616 Control Card 2	Schematic	D00 012 1616 0S
20.1018-4 Visual Overload Alarm	Schematic	B020 1018 0S (Sheet 1 Only)
0.20.1235 Analog Control Panel	Schematic Wiring	D00 020 1235 0S D00 020 1235 0W (Sheet 5 Only)
0.26.0294 Visual Overload Alarm for MDFG and Reference	Schematic	B00 026 0294 0S

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) WIRES TO BE #22 A.W.G.
   b) COAX PER B00916 0001 0.
2. ⊗ DENOTES LOCATION OF SPRINGS (ITEM #15) PER DETAIL "A".

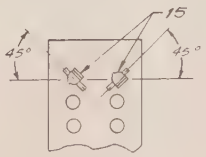
NW1	NW2		J1
	1	OVM YEL	1
	2	VM YEL	2
	3	IC YEL	3
	4	OP YEL	4
	5	Z (SCOPE) YEL	5
	6	X (SCOPE) YEL	6
	7	Y_1 (SCOPE) YEL	7
	8	Y_2 (SCOPE) YEL	8
	9	X (PLOT) YEL	9
	10	Y (PLOT) YEL	10
	11	ORM YEL	11
	12	OLS YEL	12
13	A SEL	GRN	13
14	PP	GRN	14
15	A (TIMER)	GRN	15
16	$\bar{A}$ (TIMER)	GRN	16
17	RUN (TIMER)	GRN	17
18	TB (TIMER)	GRN	18
19	Y_3 (SCOPE)	GRN	19
20	Y_4 (SCOPE)	GRN	20
21	JN (PLOT)	GRN	21
22	AJ (MODFG)	GRN	22
23	O (MODFG)	GRN	23
24	OVLD	GRN	24

CONN. BLOCK REAR VIEW

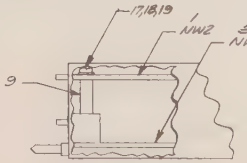

NW2 OMITTED FOR CLARITY - SEE DETAIL "B" FOR MTG.
BEND TABS TO SECURE CONN. BLOCK
P1
NW1
IDENTIFY WITH MOD. NO. IN THIS AREA.
PIN "A"
7
J1
11
EYELETS IDENTICAL TO J1 CONN. BLOCK ON BOTH CARDS, eg: EYELET 12 IS OPPOSITE J1-12, EYELET 24 IS OPPOSITE J1-24.



CONN. BLOCK FRONT VIEW



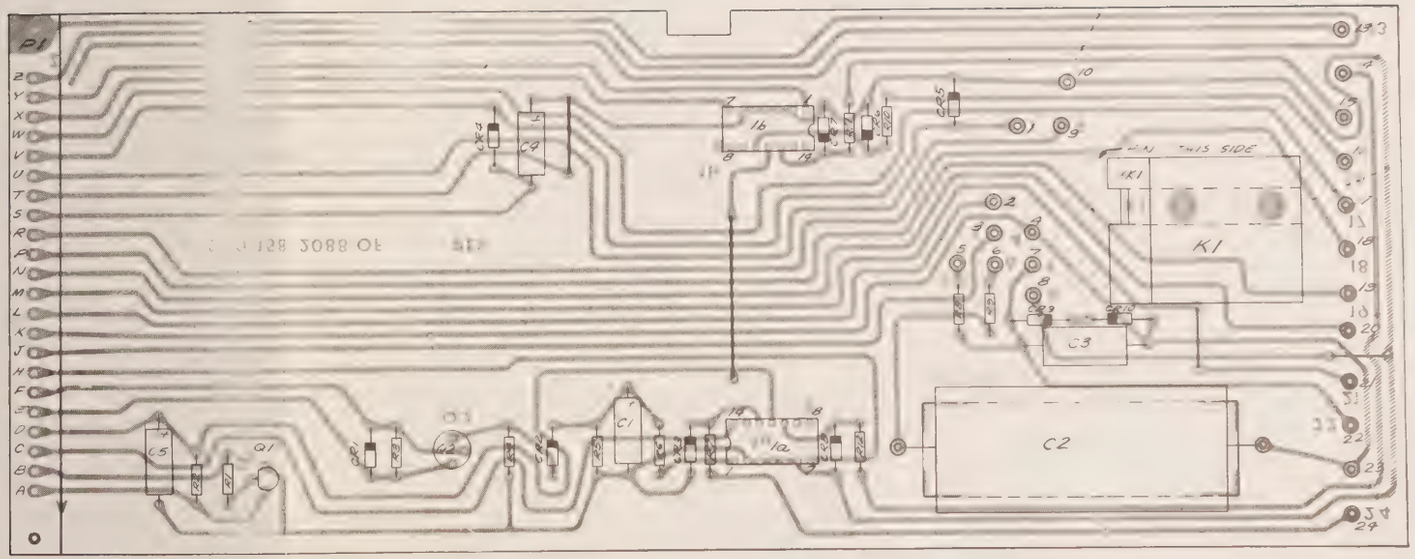
DETAIL "A"
FRONT VIEW



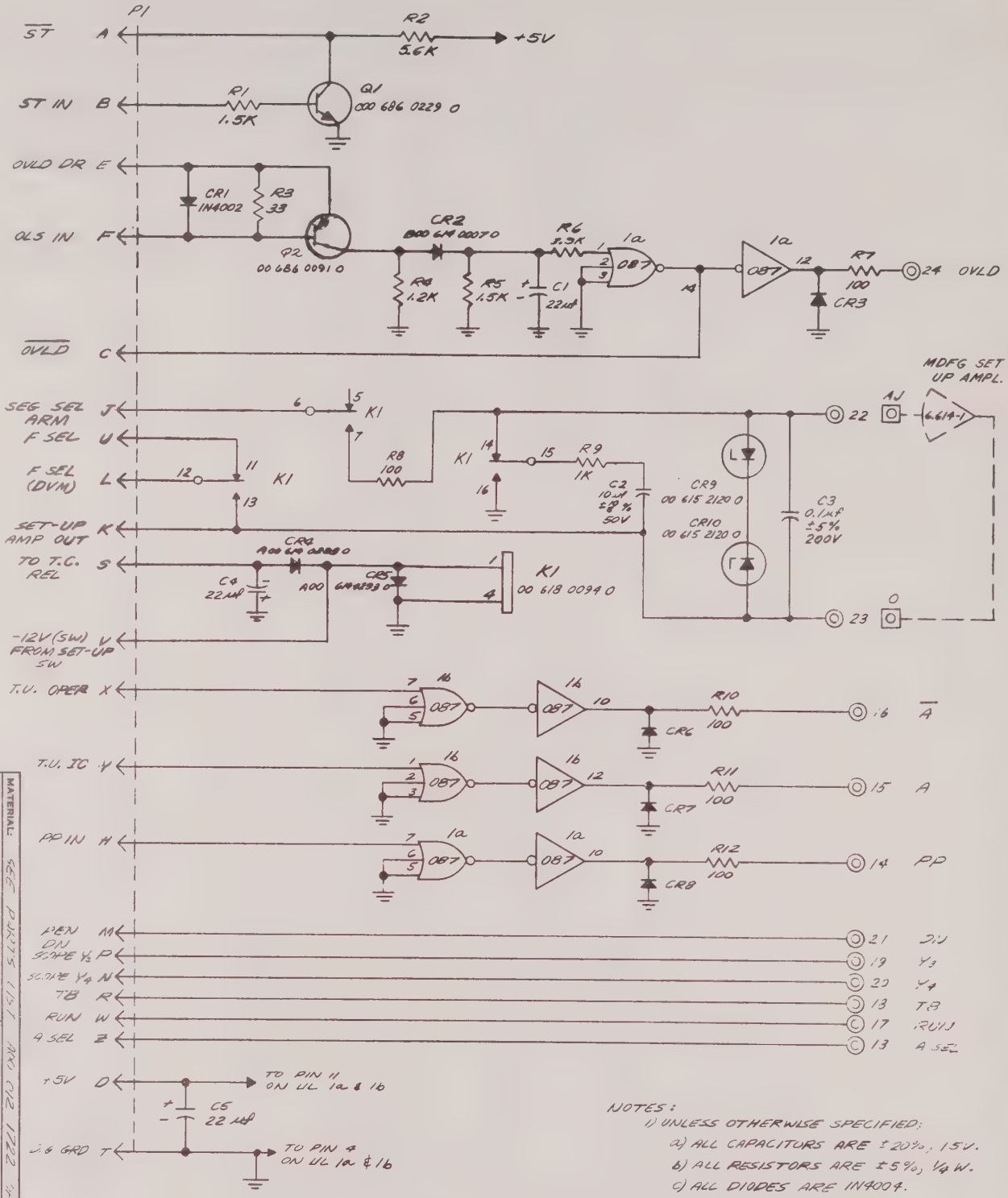
DETAIL "B"

MATERIAL SEE PARTS LIST A00 012 1700 OP
FINISH:
DRG NO MAG:
USED ON A00 012 1700 OP
SCALE 1:1
DRAWN G. MARBLE 27 SEPT 68
CHKD E.A. EBBA 2 OCT 68
DESD J. HUTTER 13 SEPT 68
APVD
SHT NO
SIZE
REV. NO.
PROJECT 10305
A00 012 1700 OP
SHEET 1 OF 2 SHEETS

EAI
ASSEMB. - WIN RING CONTROL TRAY - 286



12.1722-0 Control Card 1



NOTES:
1) UNLESS OTHERWISE SPECIFIED:
a) ALL CAPACITORS ARE ±20%, 15V.
b) ALL RESISTORS ARE ±5%, ¼ W.
c) ALL DIODES ARE IN4004.

MATERIAL: SEE PARTS LIST AND C02 1722 ...

FINISH:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES; CAPACITANCE IS IN uf; RESISTANCE IS IN OHMS; TOLERANCE ON: FRACTIONS ±.03, .XX ± .02, .XXX ± .005, ANGLES ± .5°; ± TOTAL OF MATERIAL SUPPLIED

DRAWN

SCALE

DRW. NO WAS

USED ON

DATE

ENGR

DATE

MFG

DATE

QUAL

DATE

APPD

DATE

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC CONTROL CARD #1 (3 REQ.)

PROJECT 2205

SIZE

REV. NO.

SHT. NO.

C00 02 1722 05

SHEET 1 OF 1 SHEETS

REVISIONS

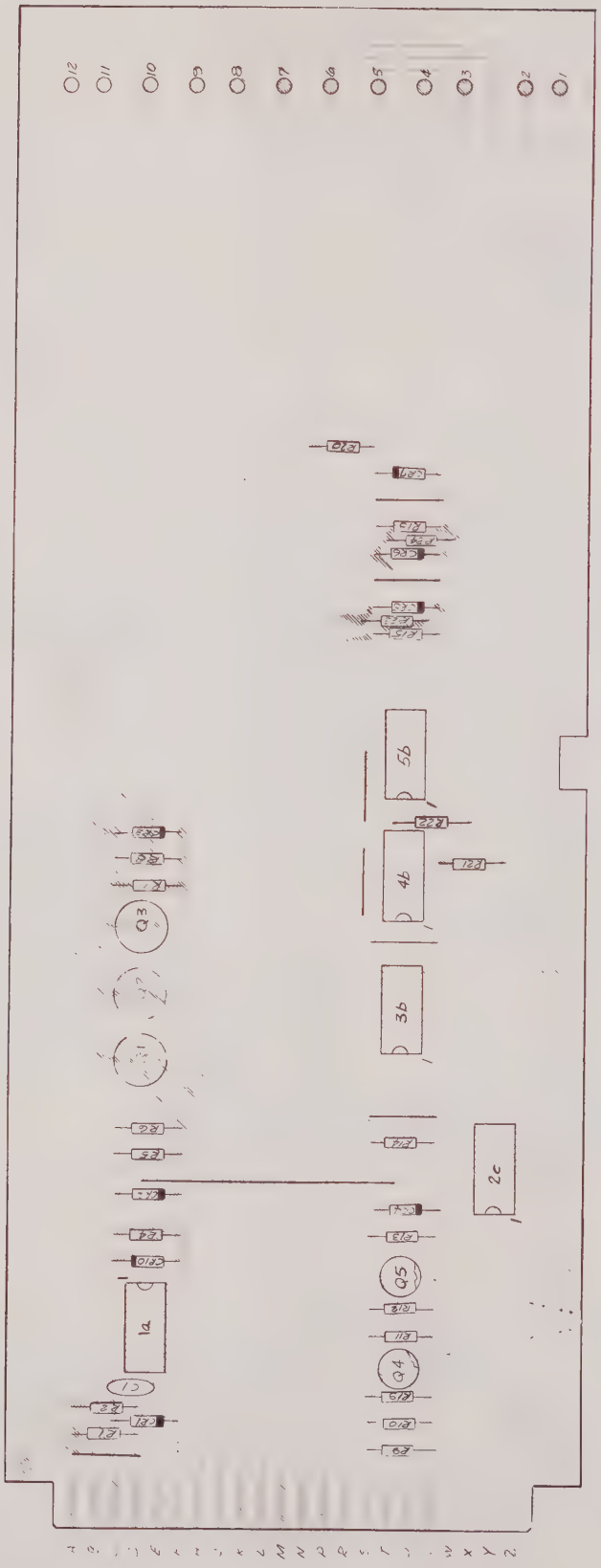
REFORMAT TO SPEC.

SEE ALSO C02 2250 0 (CHG'D FOR INCREASE RESISTABILITY)

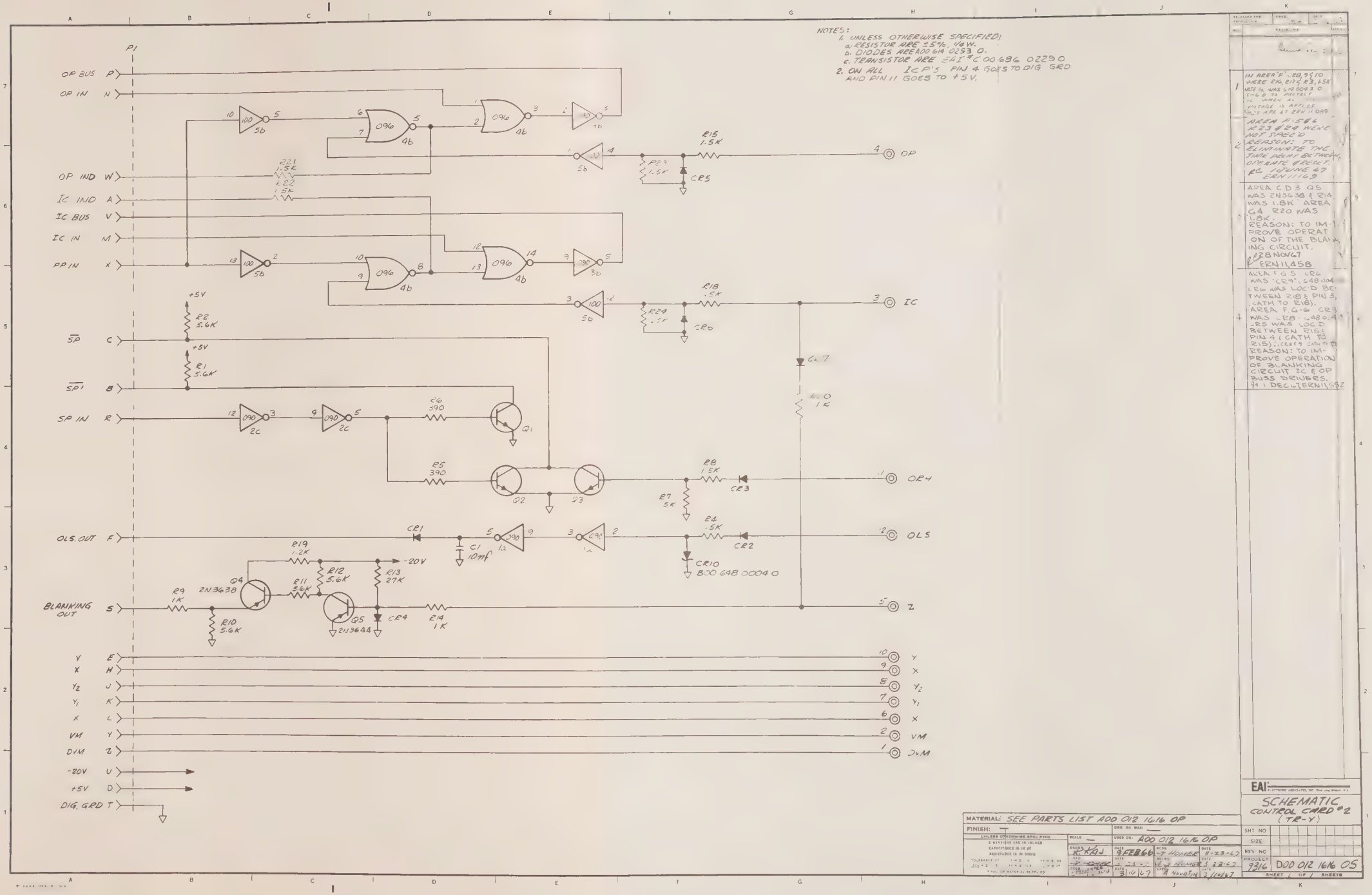
R ERN 380-0664-1

SELECTED FOR PRODUCTION

SO



12.1616-0 Control Card 2



IN AREA 'F' CR8, 9 & 10 WERE R16, R17 & R3, R5A NOTE 16 WAS 649 0093 0 CHG'D TO PROTECT IC WHEN A VOLTAGE IS APPLIED VIA R17 OR R7 ERN 11,089

AREA F-G-4 R23 & R24 WERE NOT SPACED REASON: TO ELIMINATE THE TRANSIENT BETWEEN OPERATE & RESET. RC 1 JUNE 67 ERN 11169

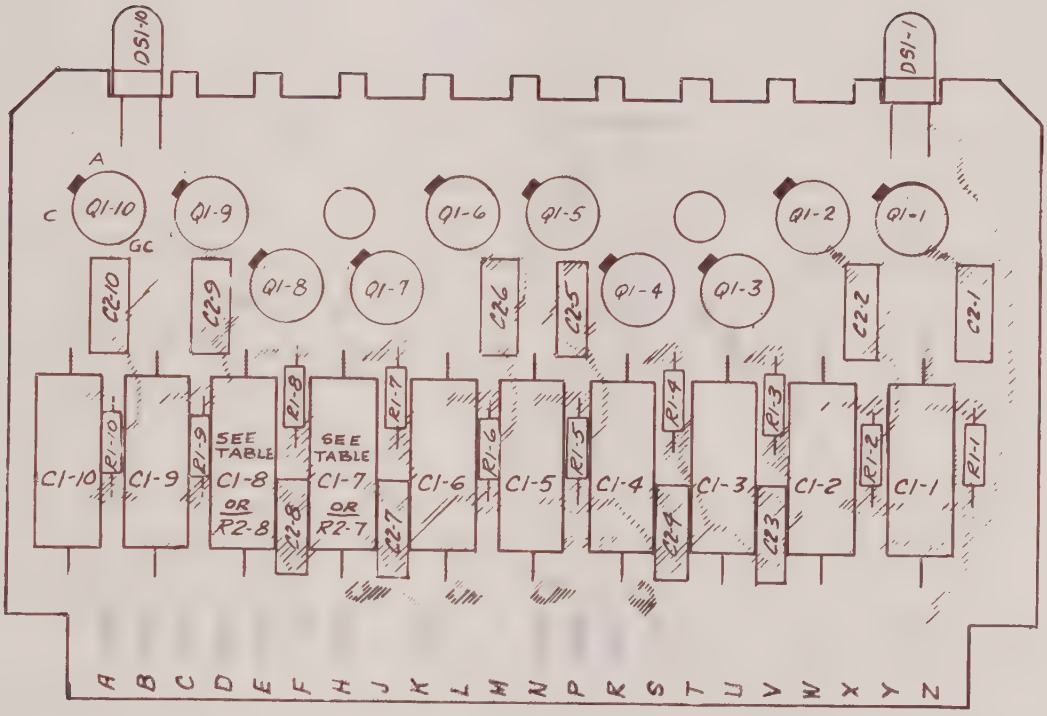
AREA C D 3 Q5 WAS 2N3638 & R14 WAS 1.8K AREA C-4 R20 WAS 1.8K. REASON: TO IMPROVE OPERATION OF THE BLANKING CIRCUIT. RC 8 NOV 67 ERN 11,458

AREA F G 5 CR6 WAS "CR9" L48 304 CR6 WAS LOC'D BETWEEN R18 & PIN 3, (ATH TO R18). AREA F G-6 CR3 WAS "CR8" L48 04 CR5 WAS LOC'D BETWEEN R15, PIN 4 (ATH TO R15) (CR8 & 9 CONT'D) REASON: TO IMPROVE OPERATION OF BLANKING CIRCUIT IC & OP BUSS DRIVERS. RC 1 DEC 67 ERN 11,592

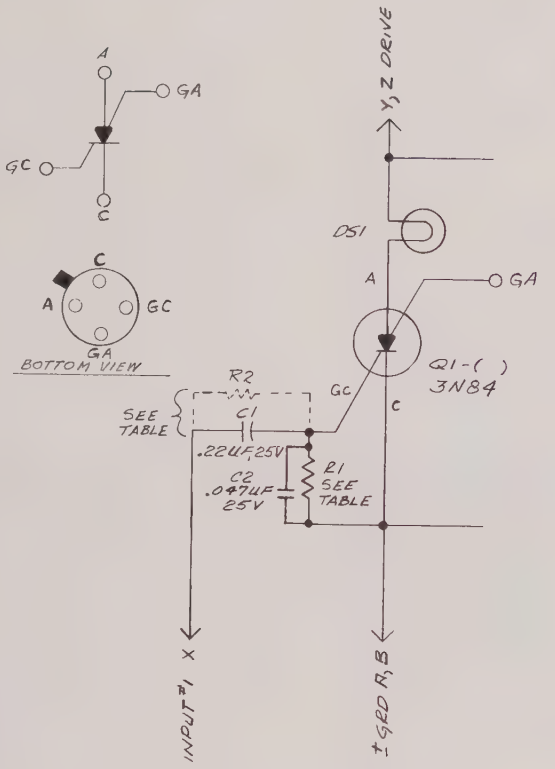
EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC CONTROL CARD #2 (TR-Y)

MATERIAL: SEE PARTS LIST ADD 012 1616 OP
FINISH:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES; CAPACITANCE IS IN μf; RESISTANCE IS IN OHMS; TOLERANCE OF .X = ±.1, .XX = ±.02, .XXX = ±.005, ANGLES = ±1°; * TOOL OF WATER ALL SHARP EDGES
SCALE —
DRAWN K KAJ 9 FEB 66
CHKD P POWER 3/10/67
ENGR POWER 3/10/67
DWG NO WAR —
USED ON ADD 012 16K OP
REL'D POWER 8-23-67
A Yovatin 3/10/67
SHT NO
SIZE
REV NO
PROJECT 9316 DDD 012 1616 05
SHEET 1 OF 1 SHEETS



20.1018-4 Visual Overload Alarm

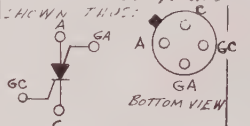


CIRCUIT TYPICAL
REPEAT 10 TIMES

NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE ± 5%, ¼ W.

RELEASED FOR PRODUCTION:	ENGR	DATE
	JNovat.JV	31 AUG 66

NO.	REVISIONS	APP'V'D
7	CLEARED REV COLUMN. BOTTOM VIEW AND SCHEMATIC OF Q1 WAS SHOWN THUS:  Q1-( ) 2N5060 WAS Q1 3N84. SEE VOID REV 6 COPY IN REPRO REASON: COST REDUCTION REV'D SHTS. 2 & 3. 8 June 68 ERN 11931	J. DeLucia
8	Q1 & ASSOCIATED BOTTOM VIEW WITH SYMBOL WAS SHOWN AS 648 0036 0 (2N5060): REV'D SHTS 2 & 3. REASON: WIDE VARIATIONS IN "TURN-ON" VOLTAGE & CURRENT WERE NOT ACCEPTABLE. 27 JAN 69 ERN 680-54-0	G. Simonetti
9	ADDED -4 VARI. FOR 380 USE. 26 MAR 69 ERN 380-094-0	G. Simonetti

20.1018-4	020 1018 4S	020 1018 4P	AS SHOWN SHT 1, R1 = 2.7K	ERN 380-094-0
20.1018-3	020 1018 3S	020 1018 3P	AS SHOWN SHT 1 EXCEPT STAGES 7 & 8. R2-7&8, 4.7K R2-2.7K. R1-7&8 = 2.2K. PLACE C1-7&8 RESP. R1-(1-6, 9 & 10)=	ERN 11.189
20.1018-2	020 1018 2S	020 1018 2P	AS SHOWN, SHT 3,	19137
20.1018-1	020 1018 1S	020 1018 1P	AS SHOWN, SHT 2,	19137
20.1018	B020 1018 0S	A020 1018 0P	AS SHOWN SHT 1, R1 = 4.7K	19137

SCHEMATIC

NOTES	ITEM	ASSY.	DESCRIPTION	USED ON:	PROJECT NUMBER

UNIT NUMBERS

MAT'L:	SEE TABLE
FINISH:	—
DWG. NO. WAS:	—
SCALE	—
USED ON:	SEE TABLE
DRAWN	LEE, DATE 27 JUNE 68
CHKD	JNovat.JV, DATE 31 AUG 66
DSGN	VIGILANTE, DATE 27 AUG 68
ACCR	DATE
REVWD	APPLO, DATE 28 JULY 65
APPVD	NOVATNJV, DATE 30 JULY 65

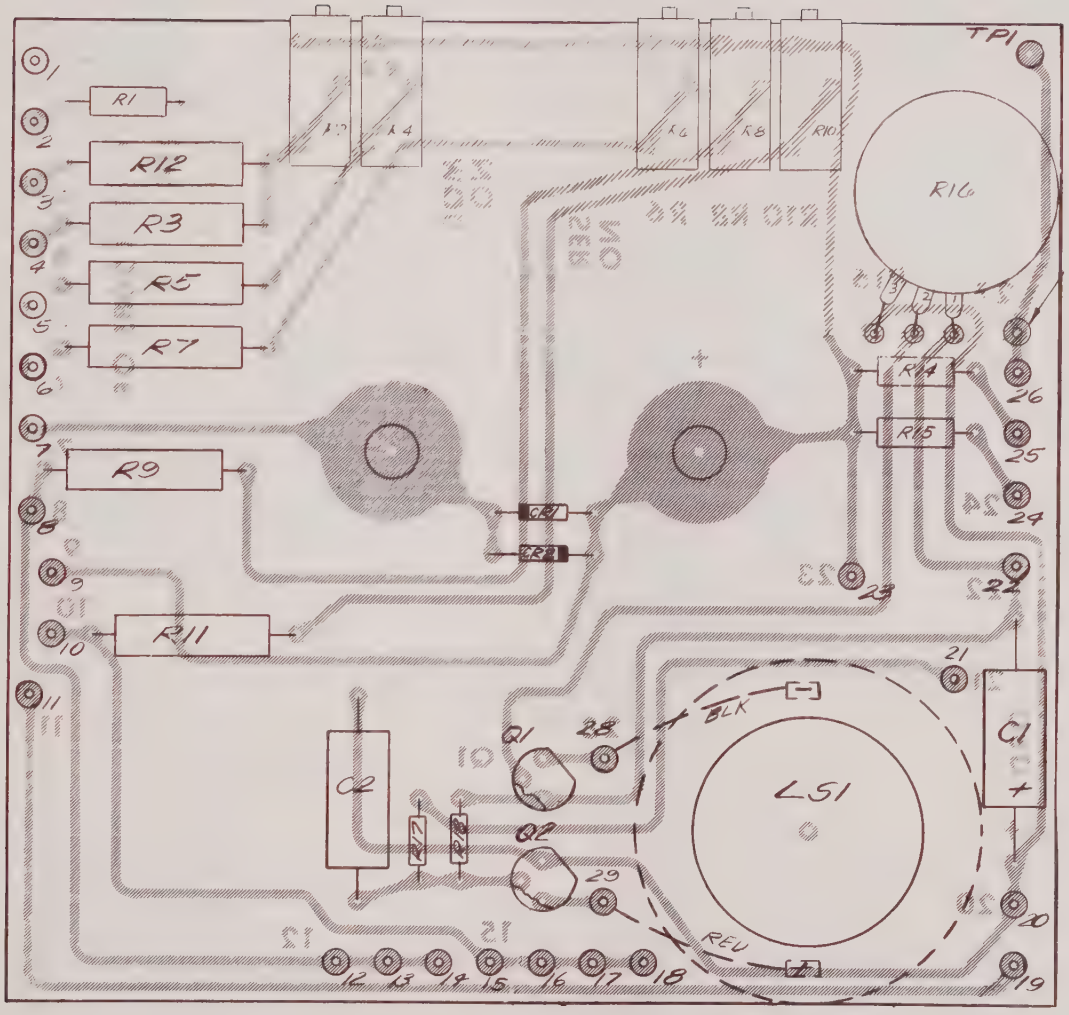
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
*TOL. OF MATERIAL SUPPLIED

ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY

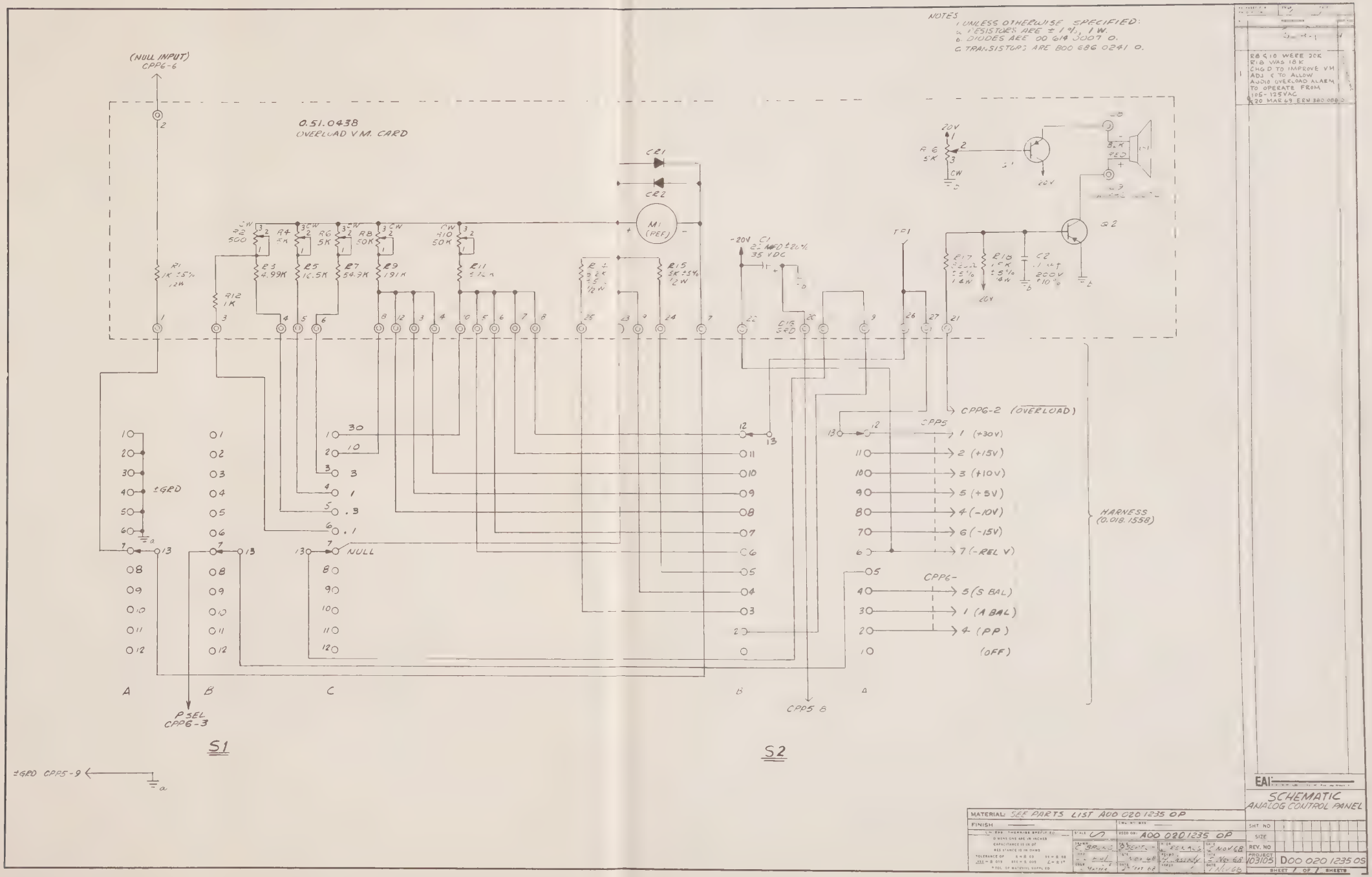
SCHEMATIC VISUAL OVL'D ALARM

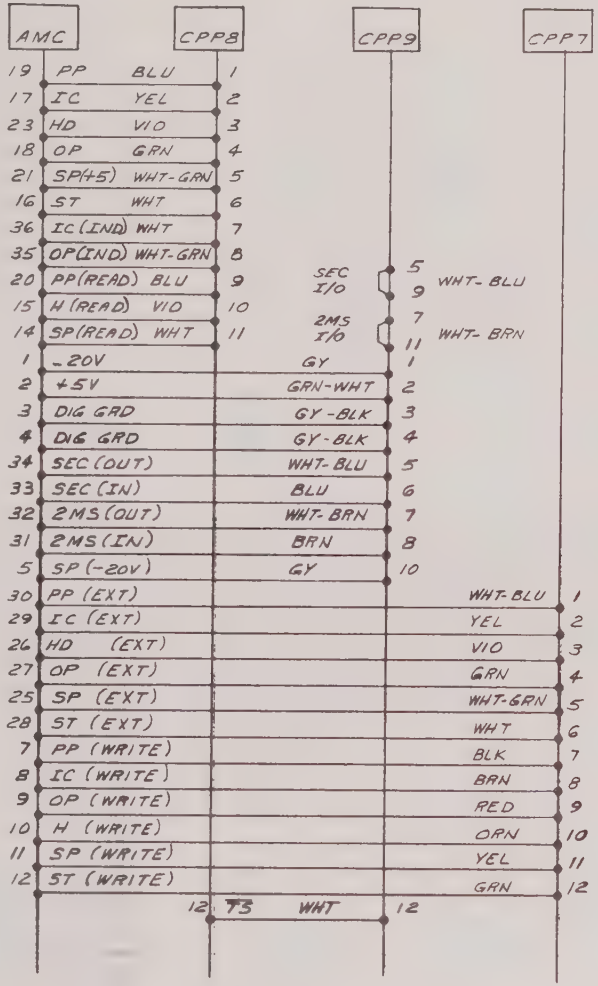
SHT. NO.	2 3
SIZE	B B
REV. NO.	5 9
PROJECT	19137
	B020 1018 0S

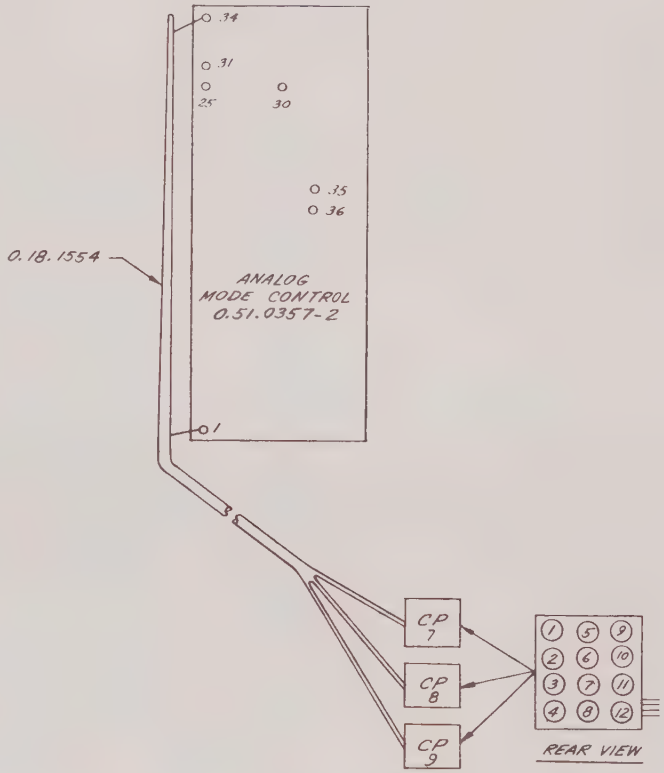
SHEET 1 OF 3 SHEETS



51.0438-0 Overload Voltmeter Card


NOTES
1. UNLESS OTHERWISE SPECIFIED:
a. RESISTORS ARE ± 1% 1/2 W.
b. DIODES ARE 00 619 0007 0.
c. TRANSISTORS ARE 800 686 0241 0.
(NULL INPUT)
CPP6-6
0.51.0438
OVERLOAD V.M. CARD
CR1
CR2
M1
(PEF)
R1
1K ±5% 2W
R12
1K
R2
500
R4
5K
R6
5K
R8
50K
R10
50K
R3
4.99K
R5
16.5K
R7
54.7K
R9
19.1K
R11
R14
9.5K ±5% 1/2 W
R15
5K ±5% 2W
-20V
C1
35 VDC
TP1
R17
±5% 1 W
R18
1 CK
±5% 1/4 W
C2
.1 MF
200V
±10%
Q1
Q2
20V
CW
SPKR
CPP6-2 (OVERLOAD)
CPP5
1 (+30V)
2 (+15V)
3 (+10V)
5 (+5V)
4 (-10V)
6 (-15V)
7 (-REL V)
CPP6-
5 (S BAL)
1 (A BAL)
4 (PP)
(OFF)
HARNESS
(0.018.1558)
±GRD
NULL
30
10
3
1
.3
.1
A
B
C
P SEL
CPP6-3
CPP5 B
S1
S2
±GRD CPP5-9
R8 & 10 WERE 20K
R18 WAS 18K
CHG'D TO IMPROVE VM
ADJ. C TO ALLOW
AUDIO OVERLOAD ALARM
TO OPERATE FROM
105-125 VAC
20 MAY 69 ERN 380 088
EAI
SCHEMATIC
ANALOG CONTROL PANEL
MATERIAL: SEE PARTS LIST A00 020 1235 OP
FINISH
USED ON A00 020 1235 OP
SHT NO 1
SIZE
REV. NO
PROJECT 103105
D00 020 1235 05
SHEET 1 OF 1 SHEETS





RELEASED FOR PRODUCTION | ENGR | DATE

NO | REVISIONS | APP'D

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

MATERIAL:

FINISH:

UNLESS OTHERWISE SPECIFIED

TOLERANCE ON: .X = ± .05 .XX = ± .02 .XXX = ± .010 .XXXX = ± .005 ∠ = ± 1°

% TOL. OF MATERIAL SUPPLIED

SCALE

DWG. NO. WAS:

USED ON:

DRAWN C.BRUNO DATE 12 OCT 68

CHKD DATE

DSGD T.P.C. & W.MATTES DATE 12 Oct 68

RCDR DATE

REVWD DATE

APPVD DATE

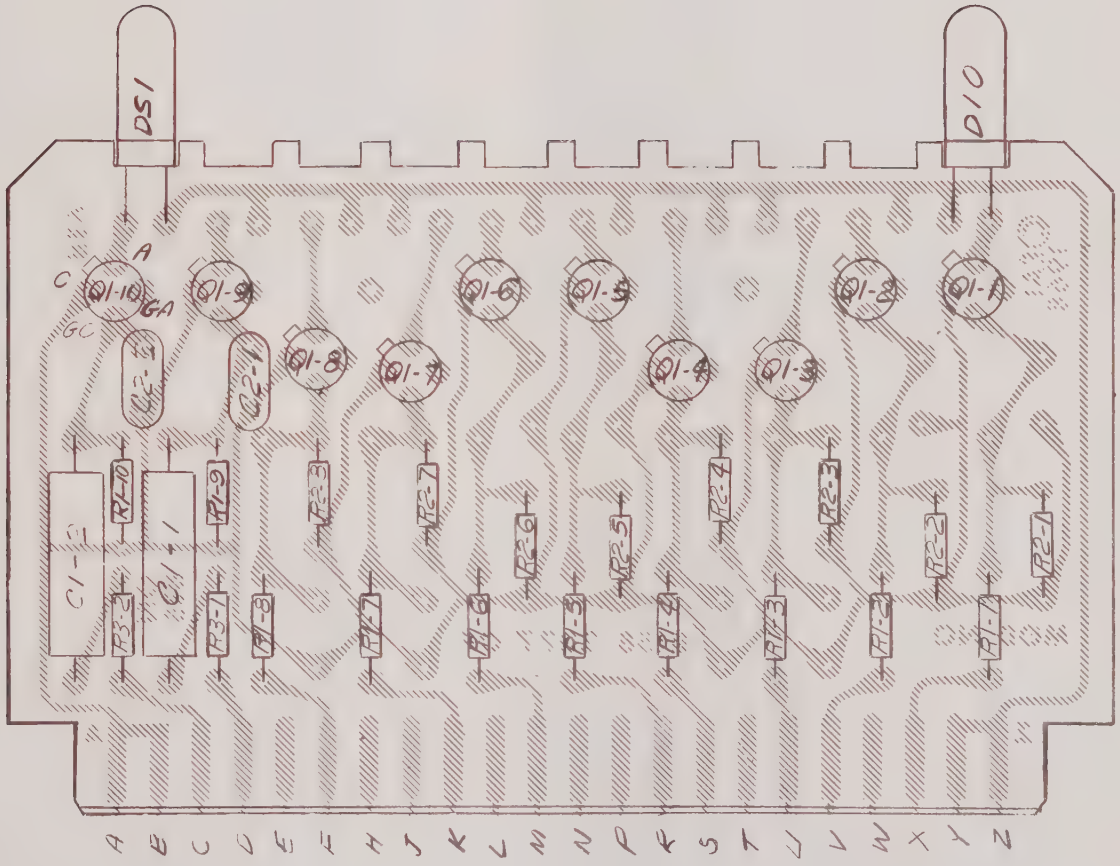
SHT. NO.

SIZE

REV. NO.

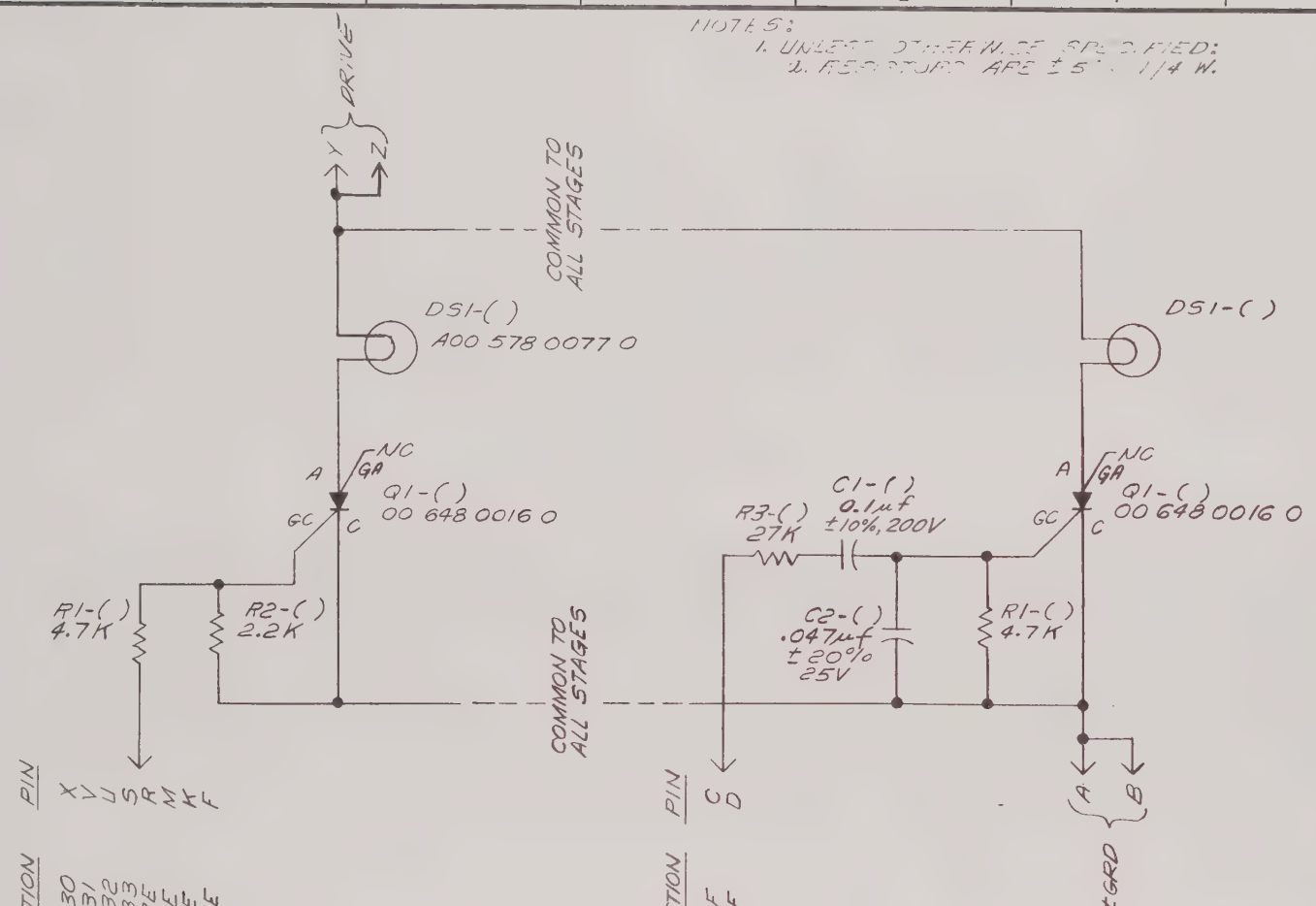
PROJECT 103105 C00 020 1235 OW

SHEET 3 OF SHEETS



26.0294-0 MDFG & REF Overload Indicator Card

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
2. RESISTORS ARE ± 5% 1/4 W.



STAGE #	FUNCTION	PIN
1	DFG 30	X
2	DFG 31	V
3	DFG 32	U
4	DFG 33	S
5	SPARE	R
6	SPARE	M
7	SPARE	K
8	SPARE	F

STAGE #	FUNCTION	PIN
9	- REF	C
10	+ REF	D

RELEASED FOR PRODUCTION:	ENGR	DATE
		9 Oct 68

NO.	REVISIONS	APP'V'D
L1	C1-( ) WAS .22μf, ±20%, 50V. 9 Oct 68 APC.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02
.XXX = ± .013 .XXX = ± .005 ∠ = ± 1°
*TOL. OF MATERIAL SUPPLIED

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC
MDFG & REF OVERLOAD INDICATOR CARD (PTC-1)

MAT'L: SEE PARTS LIST A00026 0294 OP
FINISH: —
DWG. NO. WAS: —
SCALE —
USED ON: A00 026 0294 OP

DRAWN C. BRUNO	DATE 6 SEPT 68	ICOR	DATE 10/11/68	SHT. NO.
CHKD J. L. Kull	DATE 8 Oct 68	REVWD H. Cassidy	DATE 10-10-68	SIZE
DSGR F.P. Cve N. Matter	DATE 21 Sept 68	APPVD A. Novarina	DATE 9 Oct 68	REV. NO.
				PROJECT 103105

B00 026 0294 05

SHEET 1 OF 1 SHEETS

999-3201-0 D & W BLUEPRINT CO. 28278-2

CHAPTER

7

CHAPTER 7

POWER AND REFERENCE CIRCUITS

7.1 REGULATED POWER SUPPLY 0.10.0309-1

The 0.10.0309-1 supplies all operational voltages required for the 380 Components (i.e., +30, ±15, -20, +5V and 6.3 VAC). The power supply is constructed on a small U-shaped chassis (see Figure 7.1) that mounts in a cradle behind the analog panel in the right-hand side of the 380 Cabinet. The mating cabinet connector is designated PS1.

The power supply chassis contains all components except the series regulator transistors (Q1 through Q6). These are fastened on a metal heat sink that is mounted behind the component cradles. (See Figure 1.3.)

The 0.10.0309-1 Power Supply operates directly from commercial 50 to 60 cycle power sources; the transformer primary windings are wired for 115 or 230 volts ac by jumpers on the TB1 connector in the cabinet.

Each of the voltages +30, ±15, and +5 volts are produced by a regulator circuit consisting of an input network, a series regulator circuit and a sensing circuit to control the drive and series regulator. The output levels of these voltages are remotely sensed at the distribution point, allowing the regulators to compensate for voltage drops in the distribution wiring.

7.1.1 Specifications

Listed below are the electrical specifications for the 0.10.0309-1 Power Supply.

Input Power	115 Vac ±10V, 50/60 Hz 230 Vac ±20V, 50/60 Hz
Regulated Power	+30 Vdc at 1.0 A +15 Vdc at 0-2.0 A -15 Vdc at 0-2.0 A +5 Vdc at 0-.75 A
Overload Indicator Power	6.0 Vdc at 0-2 A
Relay Power	-20 Vdc at 0-2 A
Chopper Drive	6.3 Vac at 2 A

7.1.2 Circuit Description

The circuit configuration of the 0.10.0309-1 is shown on Drawing C010 309 0S. As this drawing indicates, the unit actually consists of three regulated 15-volt supplies, a regulated 5-volt supply, a 20-volt filtered supply, an unfiltered 6-volt supply, and a 6.3 volt ac source.

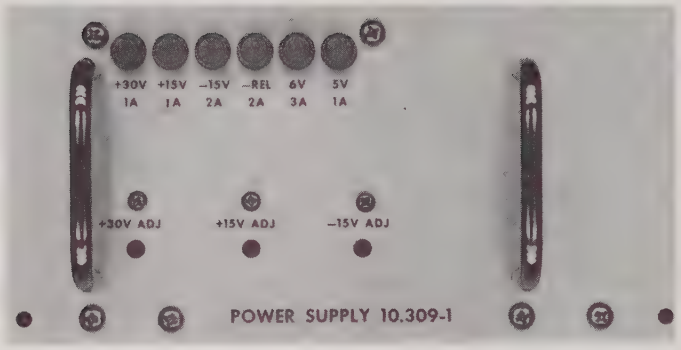


Figure 7.1. Regulated Power Supply 10.309-1

The three 15-volt supplies are all similar in circuit configuration; each consists of a full-wave rectifier, a filter capacitor, a series regulator (externally mounted) and a regulator amplifier in the form of a plug-in printed circuit card. Each two-stage regulator controls the output level of its associated rectifier-filter by amplifying any deviation from the rated 15-volt level, and applying the amplified difference voltage to the base of the associated series regulator. Thus, by controlling the emitter-to-collector impedance of the regulating transistor, the output is stabilized at the 15-volt level as long as the current-handling capability of the regulating transistor is not exceeded.

The 15-volt supplies are connected to the -15 volt, +15 volt, and +30 volt buses to facilitate distribution of this power to all components. The upper supply on the diagram (CR1-CR2) provides the -15 volt power. The second 15-volt supply (CR3, CR4) provides the +15 volt power. The +30 volt power is provided by the second and third 15-volt supplies (CR3-4, and CR5-6, respectively). This is accomplished by connecting the negative side of the third supply (P1-9, 10) to the +15 volt bus and the positive side (P1-11) to the +30 volt bus. This arrangement connects these two sources in series to provide the +30 volt potential.

The +5 volt supply is connected across the 7.5 Vac winding of Transformer T1. This supply consists of a full wave rectifier, a filter capacitor, and a regulator amplifier. The full wave rectifier consists of Diodes CR14 and CR15 and Diodes CR1 and CR2 mounted on the plug-in printed circuit card. The +5 volt supply also uses an external series regulator and operates in the same manner as described for the 15 volt power supplies.

The 6.3 volt ac output at Pins 29 and 30 of P1, is connected to bus bars 7 and 8 on power buses 1 and 3. This voltage operates the amplifier choppers in the 380.

The unfiltered 6 volt supply at Pins 27 and 28 of P1 operates the overload indicator lamps.

7.1.3 Routine Maintenance and Adjustments

Level adjustments for each of the 15-volt regulated sources are provided in the form of panel mounted screwdriver set potentiometers (Figure 7.1). The voltage levels should be checked occasionally, using the front panel voltmeter. If the supplies require adjustment, the +15 volt level should be set before adjusting the 30-volt output. This is necessary since the 30-volt supply is comprised of two series-connected 15-volt supplies.

Resistor R4, on the 0.43.0165-1 Regulator Card is used to adjust the +5 volt level. This card is mounted under the 0.10.0309-1 Power Supply as shown in Figure 7.2 and requires an 0.19.1207 Service Cable for adjustment. However, after the initial adjustment at the factory the +5 volt regulator usually requires no further adjustment since its tolerable limits are 5 volts ±10%.

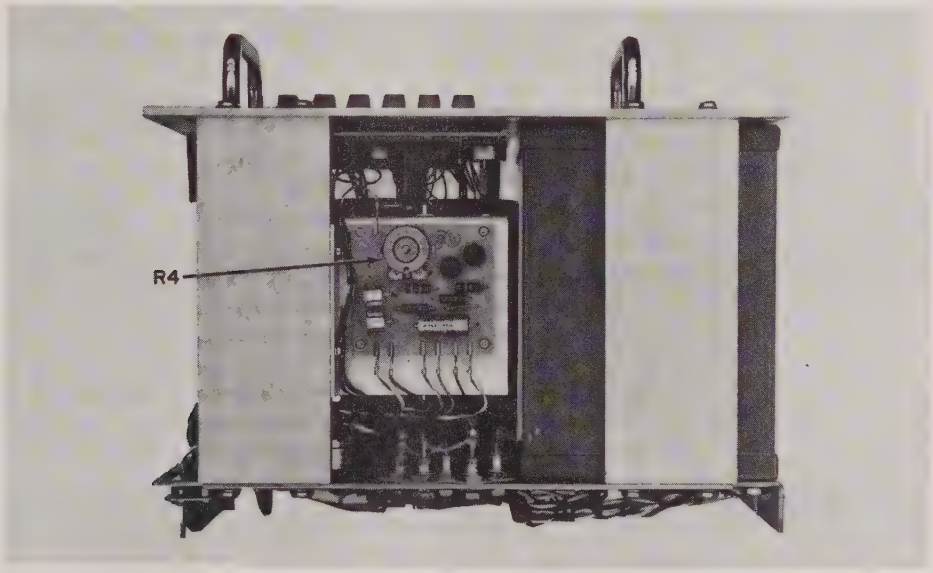


Figure 7.2. +5 Volt Adjustment Location

Preventive maintenance of the 0.10.0309-1 should consist of an occasional check of the ability of each source to maintain regulation under maximum load conditions. This can be accomplished by connecting appropriate values of load resistances across each supply to determine that the supply maintains regulation up to the maximum load current indicated in Sub-paragraph 7.1.1.

Usually a power supply malfunction results in complete loss of regulation; this is evidenced by overload indications in all amplifiers. In nearly all cases of regulation failure, the trouble can be cured by transistor replacement.

7.1.4 Power Supply Adjustment Procedure

7.1.4.1 *Required Equipment.* Digital voltmeter (DVM), accurately calibrated and having a resolution of 10 millivolts and a full scale range of 30 volts.

7.1.4.2 *Adjustment Steps*

1. Assure that primary ac power is within the specified limits, and that the line voltage jumpers (TB1) are the appropriate positions. Apply power and allow the equipment to warm up for one half hour. See Figure 7.1 for location of adjustment potentiometers.
2. Connect the DVM between the +30 volt bus and central ground (Figure 8.2).
3. Set the +30 volt level control for an output of +30.000 volts within ±10 millivolts.
4. Connect the DVM input to the +15 volt bus. Set the +15 volt level control for an output of +15.000 volts ±10 millivolts.
5. Connect the DVM to the -15 volt bus. Set the -15 volt level control for an output of -15.000 volts ±10 millivolts.
6. Connect the DVM to the +5 volt bus. Set the +5 volt level control for an output of +5.00 volts ±10 millivolts.

7.2 REFERENCE REGULATOR 0.43.0104-1

7.2.1 General

The 380 uses a system reference level of ±10 volts for computational purposes. These potentials are generated by the 0.43.0104-1 Reference Regulator (Figure 7.3) and 0.6.0626 Dual DC Amplifier; both of these components are located in cradles behind the analog panel in the left-hand bay of the 380 Cabinet. The mating cabinet connectors for the amplifier and regulator are designated RA and RR respectively.

The reference regulator includes a temperature-stabilized Zener diode which functions as an internal reference standard. Under normal operating conditions, the regulator-amplifier combination generates ±10 volt potentials that are maintained to within 0.02% of 10 volts, and are stable up to the maximum output of 250 milliamperes for each reference source.

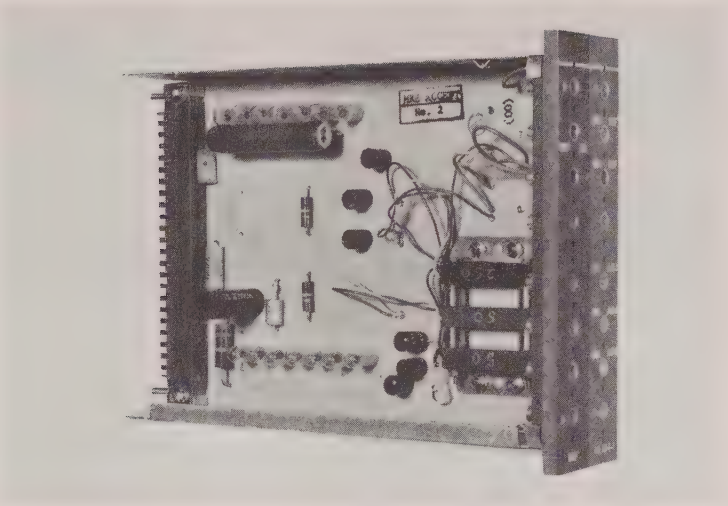


Figure 7.3. Reference Regulator 0.43.104-1

Provision is made for using an external 10-volt reference source. The external reference line is terminated at Pin T of RR, by connecting the external reference source to this point and changing one patch cord (see Sub-paragraph 7.2.2), the computer reference circuits can be slaved to an external voltage standard.

7.2.2 Reference Patching

To connect the 380 reference circuits for internal reference, a patch cord is required between the REF IN and INT REF terminations on the reference regulator front panel. If an external 10-volt standard is to be used, the REF IN termination should be patched to EXT REF. To connect the amplifier to the regulator, each of the S terminations on the regulator must be patched to a corresponding S termination on the 0.6.0626 Dual DC Amplifier.

7.2.3 Circuit Description

The configuration of the 380 reference circuits is shown in Figure 7.4.

The ±10 volt reference potentials are generated by using a Zener diode as a voltage standard, and applying the zener-stabilized potential to a pair of cascaded dc amplifiers with sufficient gain to develop the required reference levels. As shown in Figure 7.4, CR1 (the Zener diode) and R10 are connected across the +30 volt supply to provide a stable source of approximately +9.3 volts. Resistors R7, R8, and R9 form the amplifier input resistors; R5 is connected as a 10,000 ohm feedback resistor across the amplifier. The input resistance value is selected and set at the time of manufacture so that the amplifier output is exactly 10 volts. To permit the reference source to deliver more load current than the amplifier itself is capable of delivering,

an emitter-follower power stage (Transistor Q2, mounted on the heat sink bracket), is driven by the amplifier. With this arrangement, the maximum load current capability of the source is increased to about 250 milliamperes.

The negative reference source consists of a similar arrangement. In this case the closed-loop gain of the amplifier is unity, thus multiplying the -10 volt level by a factor of -1 to develop the +10 volt potential. Potentiometer R1 permits a small gain adjustment (BAL ADJ) so that the plus and minus 10 volt levels may be precisely balanced with respect to each other.

To protect the reference circuits from overload damage, a bank of incandescent lamps is connected into the emitter circuit of each power amplifier. These lamps permit the amplifiers to function normally when delivering load currents of up to about 250 milliamperes. If a reference source is loaded beyond this point, the circuit loses regulation, the output level drops accordingly, and no damage can occur to the reference supply components.

7.2.4 Routine Maintenance and Adjustment

Prior to shipment, each reference regulator is adjusted to yield -10 volts ±0.02%; the positive source is balanced against this standard. These reference levels may be checked and readjusted at any time, if *sufficiently accurate equipment is available.* If not, EAI recommends that the regulator be returned to the factory should component replacement or adjustment become necessary.

When required, the balance control (BAL ADJ) on the reference regulator may be adjusted to within 0.01% by using measuring circuits provided by the 380 itself. (See Figure 7.5.) To set this control, use two gain-of-10 summing amplifier inputs; patch plus reference to one input and minus reference to the other. Observe the amplifier output with the control panel voltmeter on the 0.1 volt scale. Set the BAL ADJ control for a zero reading. Reverse the input polarities and again observe the amplifier output. If a voltage is indicated, set the BAL ADJ control for the mean of the difference. Continue this process until the same voltage (in both polarities) is obtained when switching the reference inputs.

7.2.5 Reference Adjustment Procedure

7.2.5.1 *Required Equipment.* Equipment capable of measuring ±10.000 volts within a maximum absolute error of 500 microvolts or less. This may consist of a differential null voltmeter (such as the Fluke, Model 825 or the Keithley, Model 662); a precision ratio bridge, galvanometer, and standard cell; or a precision power supply and comparison circuit.

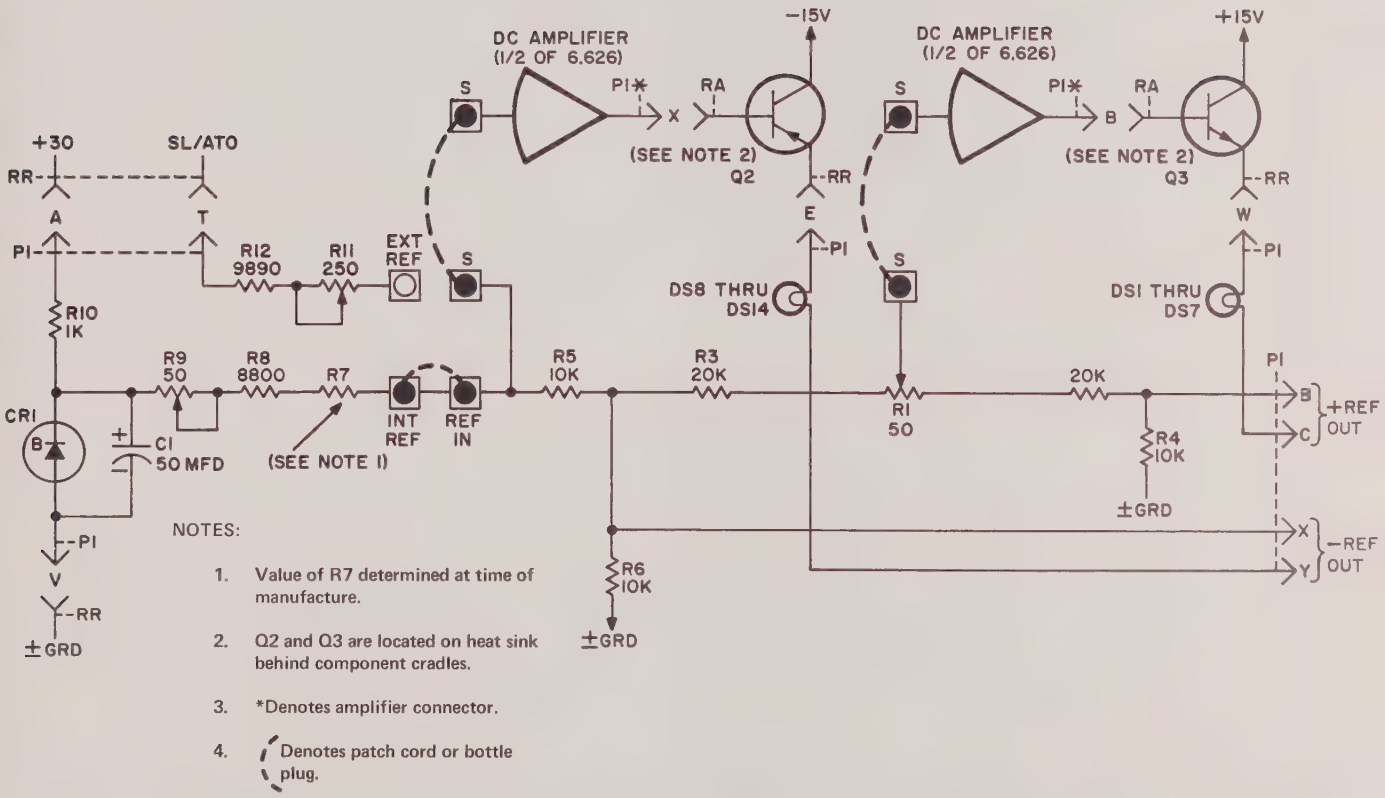


Figure 7.4. 380 Reference Circuit, Simplified Schematic

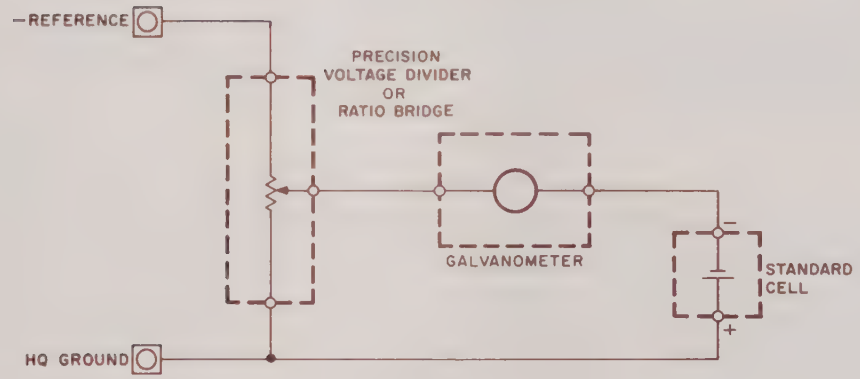
7.2.5.2 *Adjustment Steps*

1. The adjustment procedure for the ±reference regulators depends on the equipment available. In no case should adjustment be attempted unless sufficiently accurate, carefully calibrated test equipment is available (see Paragraph 7.2.5.1).

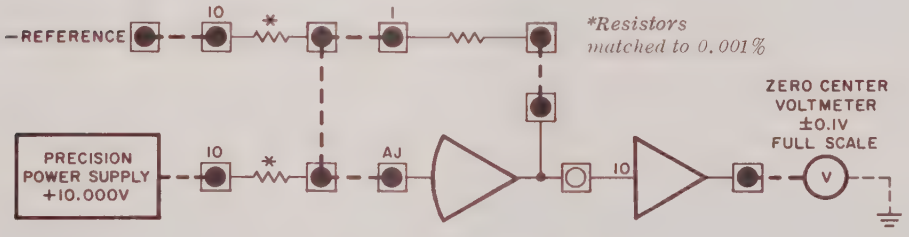
   If a differential null voltmeter is available, connect the instrument between the -reference bus (following the manufacturer's instructions) and central ground. Adjust the INT ADJ pot for an output of -10.000 volts ±1 millivolt on the 0.43.0104-1 Reference Regulator.

   If a voltage divider-galvanometer-standard cell circuit is used, patch the circuit of Figure 7.5a. Set the voltage divider or ratio bridge controls as required by the standard cell potential, then adjust the -reference coarse and fine level controls until the galvanometer indicates a null.

   If a precision power supply is used, patch the circuit of Figure 7.5b, and adjust the INT ADJ pot for an indicated output of zero volt.



(a) Galvanometer Circuit



(b) Precision Power Supply Circuit

Figure 7.5. Internal Reference Adjustment Circuits

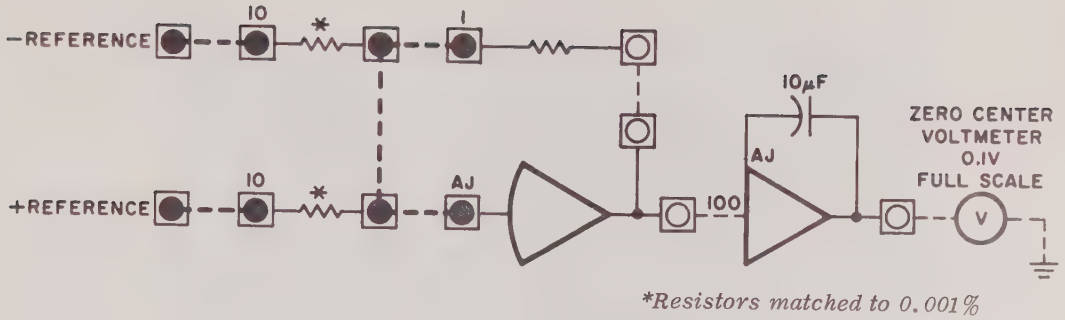


Figure 7.6. Reference Balance Adjustment Circuit

2. When the -reference level has been set, the +reference is balanced against this potential so that the absolute values of both reference potentials are equal. Patch the circuit of Figure 7.6 and adjust the +reference level control (the balance control) until the meter indicates an output of zero volt.

7.3 DUAL DC AMPLIFIER 0.6.0626

7.3.1 General

As previously indicated this unit contains the two operational amplifiers used with the 0.43.0104-1 Reference Regulator to generate the plus and minus 10 volt reference potentials.

This amplifier (Figure 7.7) contains two independent high gain chopper stabilized amplifiers. One amplifier is used for minus reference, the second amplifier is used for plus reference. Since the two amplifiers are identical, only one is described. Refer to Schematic Diagram C006 615 0S for the following description.

The amplifier is composed of a dc section shown on the upper portion of the drawing and an ac stabilizer section shown on the lower portion of the drawing.

The dc section is composed of three stages of amplification (Q2-Q3-Q4), emitter-follower input stage (Q1), emitter-follower driver stage (Q5), and a complementary symmentry output stage (Q6-Q7).

The ac section is an ac coupled dc amplifier composed of three stages of amplification (Q9-Q10-Q11), an emitter-follower input stage (Q8), and a chopper (D1).

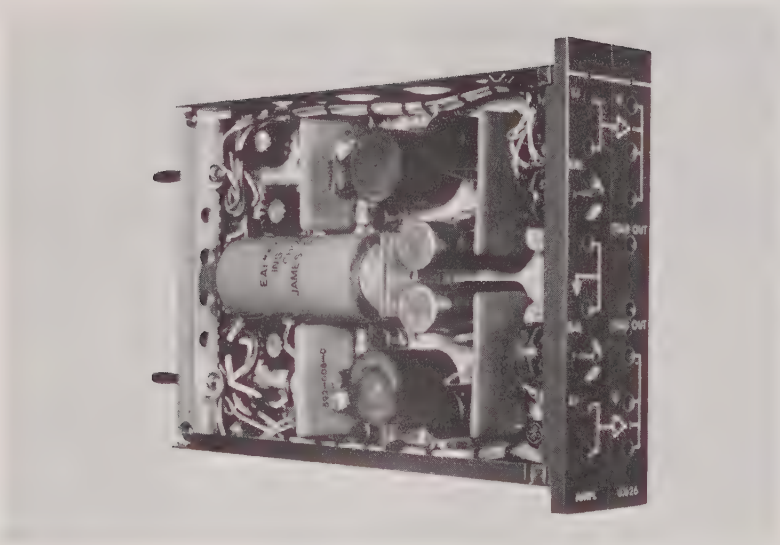


Figure 7.7. Dual DC Amplifier 0.6.0626

In the dc section, C1 blocks dc inputs which are then converted to ac by the chopper, amplified, restored to dc by the chopper, and are applied to the input through R6 and R5. The diodes (CR1-CR2) in the input stage limit the input voltage, thereby providing fast recovery from overload. The lamps (R17-R18-R19) in the driver and output stages increase in resistance as current increases, thus acting as a current limiting device to stabilize and protect the components in these stages.

The chopper (D1) in the ac section alternately grounds the input and output of the ac stabilizer amplifier. This action converts the dc input to ac, as well as converting the ac output to dc. The output is filtered by C11 and the associated resistors.

7.3.2 Adjustment Procedure

The 0.6.0626 is balanced at the factory and should be checked occasionally. The balance pots for the amplifier are mounted in the front of the unit. The procedure for balancing the reference amplifiers is as follows:

1. Monitor the STAB OUT (stabilizer output) terminal on the front block of the amplifier with the computer voltmeter or other zero-center voltmeter set to the 3 volt range.
2. Adjust the BAL (balance) potentiometer on the 0.6.0626 Amplifier for minimum reading. Increase the range of the meter according to the voltage level while adjusting the potentiometer. The final reading should be essentially zero.

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

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0.43.0165-1 +5V Regulator	7-19
0.43.0104-1 Reference Regulator	--
0.43.0105-1 Reference Regulator Card	7-20
0.43.0188-0 Power Supply Voltage Regulator	7-21

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	J1	Connector Block: Lettered (AMP 6.626)	00 542.1170-0	B
2	P2	Connector	00 542.1033-1	B
3	R1,2	Resistor, Variable, Composition: 50K ohms ±30%, 0.2W (Chicago Telephone Supply Series 70 HH1860 or equal)	00 642.0351-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

θ

DATE 12/ 20 / 68

UNIT TITLE

DUAL DC AMPLIFIER

MODEL NO.

0.6.0626 Sh. 1 of 1 Sh.

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1-()	Capacitor	00 521.0166-1	B
2	C2-()	Capacitor	00 516.0260-0	B
3	C3-()	Capacitor, Fixed, Ceramic: 39 pf ±5%, 1000V (Sprague 20C265(10TCC-Q39) or equal)	00 515.0103-0	A
4	C4-()	Capacitor, Fixed, Ceramic: 12 pf ±5%, 1000V (Erie Type 835 or equal)	00 511.1120-2	A
5	C5-()	Capacitor, Fixed, Plastic: 0.0033 uf ±5%, 200V (Sprague Type 192P or equal)	00 522.1332-0	A
6	C6-()	Capacitor, Fixed, Plastic: 0.033 uf ±5%, 200V (Gudeman Type 356 or equal)	00 522.2333-0	A
7	C7-()	Capacitor, Fixed, Ceramic: 22 pf ±5%, 1000V (Sprague 192C411(10TCC-Q22 or equal)	00 515.0096-0	A
8	C8-()	Capacitor	00 521.0165-0	B
9	C9-()	Capacitor, Fixed, Ceramic: 20 nf -40% +60%, 150V (Centralab DDM-203 or equal)	00 515.0180-0	A
10	C10-()	Capacitor,Fixed, Ceramic: 47 nf ±20%, 25V (Sprague Type 3C or equal)	00 511.5473-4	A
11	C11-()	Capacitor, Fixed, Electrolytic: 100 uf -10% +100%, 6V (Int. Elect. Ind. APS-102 or equal)	00 516.0261-0	A
12	C12-()	Capacitor	00 516.0264-0	B
13	C13-(), 14-()	Capacitor, Fixed, Plastic: 0.047 uf ±5%, 200V (Sprague Type 192P or equal)	00 522.2473-0	A
14	CR1-(),2-()	Diode	00 614.0007-0	B
15	CR3-(),5-()	Diode (ITT G-187 or equal)	00 614.0043-0	A
16	CR4-()	Diode	00 614.0199-0	B
17	D1	Chopper	00 530.0065-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

DUAL DC AMPLIFIER

MODEL NO.

0.6.0615-0

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
18	NW1-()	Integrated Circuitry: Resistor Network	00 592.0062-0	B
19	NW2-()	Integrated Circuitry: Resistor Network	00 592.0063-0	B
20	P1	Connector, Plug: 22 Contacts; Male (Amphenol 133-022-23 or equal)	00 542.0419-0	A
21	Q1-(),3-(), 8-()	Transistor: (Amperex ME901 or equal)	00 686.0238-0	A
22	Q2-()	Transistor	00 686.0109-0	B
23	Q4-()	Transistor	00 686.0129-0	B
24	Q5	Transistor	00 686.0325-0	B
25	Q6	Transistor: (GE 4JX1C1286 or equal)	00 686.0091-0	A
26	Q7-()	Transistor: (Texas Inst. N558 or equal)	00 686.0093-0	A
27	Q9-()	Transistor	00 686.0248-0	B
28	Q10-(),11-()	Transistor	00 686.0111-0	B
29	R1-()	Resistor, Fixed, Composition: 4.7 megohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0475-0	A
30	R2-()	Resistor, Fixed, Composition: 68 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0683-0	A
31	R3-(),5-()	Resistor, Fixed, Composition: 220K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0224-0	A
32	R4-()	Resistor, Fixed, Composition: 68 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0680-0	A
33	R6-()	Resistor, Fixed, Composition: 22K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0223-0	A
34	R7-()	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0472-0	A
35	R8-()	Resistor, Fixed, Composition: 5.1K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0512-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 12 / 22 / 68

UNIT TITLE

DUAL DC AMPLIFIER

MODEL NO.

0.6.0615-0 Sh. 2 of 3 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
36	R9-()	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0472-0	A
37	R10-()	Resistor, Fixed, Composition: 15K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0153-0	A
38	R11-()	Resistor, Fixed, Composition: 27K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0273-0	A
39	R12-()	Resistor, Fixed, Composition: 180 ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0181-0	A
40	R13-()	Resistor, Fixed, Composition: 100K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0104-0	A
41	R14-()	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0822-0	A
42	R15-()	Resistor, Fixed, Composition: 3.3 megohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0335-0	A
43	R16-()	Resistor, Fixed, Composition: 33K ohms ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0333-0	A
44	R17-(),19-()	Resistor, Non-Linear	00 646.0065-0	B
45	R20-()	Resistor, Fixed, Composition: 1K ohm ±5%, 1/4W (Allen-Bradley CB or equal)	00 625.0102-0	A
46	XD1	Socket, Electron Tube: 9 Contacts (Elco 05-4008 or equal)	00 650.0075-0	A
47	XQ1-(),3-() 8-()	Socket	00 650.0162-0	B
48	XQ2-(),4-() thru 7-(), 9-(),10-(), 11-()	Socket, Transistor: 3 Contacts (Augat 8069-1G1 or equal)	00 650.0121-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 12/ 23 /68

UNIT TITLE

DUAL DC AMPLIFIER

MODEL NO.

0.6.0615-0 Sh. 3 of 3 Sh.

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1,2,4	Capacitor, Fixed, Electrolytic: 4500 uf, 25V (Mallory Type WP SP020-6312 or equal)	00 516.0245-0	A
2	C3	Capacitor	00 516.0253-0	B
3	C5	Capacitor, Fixed, Electrolytic: 6000 uf +75% -10%, 10V (Sprague 36D602G010AA2A or equal)	00 516.0512-0	A
4	CR1,2,3,4, 7,8	Rectifier: 1N1342A	00 614.0124-0	A
5	CR5,6,9,10	Rectifier: 1N4002	00 614.0110-0	A
6	CR11,12	Rectifier (Motorola MR1032A or equal)	00 614.0255-0	A
7	F1,2,4	Fuse, Cartridge, Fast Acting: 2A, 125V (Bussman Type GMW-2 or equal)	00 570.0138-0	A
8	F3,6	Fuse, Cartridge, Fast Acting: 1A, 125V (Bussman Type GMW-1 or equal)	00 570.0136-0	A
9	F5	Fuse, Cartridge, Fast Acting: 3A, 125V (Bussman Type GMW-3 or equal)	00 570.0144-0	A
10	F7	Fuse, Cartridge, Fast Acting: 2A, 250V (Bussman GJV-2 or equal)	00 570.0173-0	A
11	P1	Connector, Plug: 32 Contacts; Male (Amphenol 26-159-32 or equal)	00 542.0029-0	A
12	T1	Transformer	00 684.0233-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

REGULATED POWER SUPPLY

MODEL NO.

0.10.0309-1 Sh. 1 of 1 Sh.

DATE 12 / 20 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C7	Capacitor	00 516.0199-0	B
2	C8,9	Capacitor	00 516.0198-0	B
3	CR3	Diode: 1N754	00 614.0046-0	A
4	CR6	Diode: 1N4002	00 614.0110-0	A
5	Q5	Transistor: 2N3638A	00 686.0305-0	A
6	Q6	Transistor	00 686.0325-0	B
7	R15	Resistor, Fixed, Composition: 10K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0103-0	A
8	R16,17	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0472-0	A
9	R18	Resistor, Fixed, Composition: 470 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0471-0	A
10	R19	Resistor, Fixed, Composition: 1K ohm ±5%, 1/2W (Allen-Bradley CB or equal)	00 626.0102-0	A
11	R20	Resistor, Fixed, Composition: 560 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0561-0	A
12	R21	Potentiometer	00 642.0443-0	B
13	R24	Resistor, Fixed, Composition: 75 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0750-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
POWER SUPPLY REGULATOR

MODEL NO.
0.43.0107-0 Sh. 1 of 1 Sh.

10

DATE 12 / 20 / 68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1	Capacitor, Fixed, Electrolytic: 47 uf ±20%, 35V (Sprague Type 150D or equal)	00 517.1476-4	A
2	CR1,2	Rectifier: (Motorola MR1032A or equal)	00 614.0255-0	A
3	CR3	Diode: Zener (Motorola 1/2M2.4AZ or equal)	00 614.0307-0	A
4	Q1,2	Transistor: 2N3569	00 686.0260-0	A
5	R1	Resistor, Fixed, Composition: 10K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0103-0	A
6	R2	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0222-0	A
7	R3	Resistor, Fixed, Composition: 240 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0241-0	A
8	R4	Resistor, Variable	00 642.0450-0	B
9	R5	Resistor, Fixed, Composition: 270 ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0271-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
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B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
+5V REGULATOR

MODEL NO.
0.43.0165-1 Sh. 1 of 1 Sh.

2 DATE 12/ 20 / 68

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
		NOTE If replacement of either the Zener Diode (CR1) or Padder Resistor (R7) is necessary both items must be replaced by a 00 012.0852-0 Network (NW1).		
1	C1	Capacitor	00 516.0198-0	B
2	C2	Capacitor, Fixed, Ceramic: 220 nf ±20%, 25V (Mucon 21984-9 or equal)	00 515.0249-0	A
3	C3	Capacitor, Fixed, Ceramic: 220 pf ±10%, 500V (Aerovox C1-1X5P221K or equal)	00 515.0042-0	A
4	DS1 thru 17	Lamp	00 578.0047-0	B
5	NW1	Network: Zener-Resistor	00 012.0852-0	B
6	P1	Connector, Plug: 22 Contacts; Male (Amphenol 133-022-43 or equal)	00 542.0488-0	A
7	R1	Resistor, Variable, Wirewound: 50 ohms ±10%, 1/4W (Bourns 200L-1-500 or equal)	00 642.0074-0	A
8	R2,3	Resistor, Precision	00 638.0702-0	B
9	R4,6	Resistor, Fixed, Composition: 10K ohms ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0103-0	A
10	R5	Resistor, Precision	00 638.0473-0	B
11	R8	Resistor, Precision	00 638.0315-0	B
12	R9,11	Resistor, Variable, Wirewound: 250 ohms ±10%, 1/4W (Bourns 271-1-251 or equal)	00 642.0491-0	A
13	R10	Resistor, Fixed, Composition: 1K ohm ±5%, 1/2W (Allen-Bradley EB or equal)	00 626.0102-0	A
14	R12	Resistor, Precision	00 638.0835-0	B
15		Connector Block: Lettered (43.104)	00 542.1596-0	B

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

REFERENCE REGULATOR CARD

MODEL NO.

0.43.0105-1 Sh.1 of 1 Sh.

7

DATE 12 / 23 / 68

M446

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	Q1,2,4, 5,6	Transistor: 2N3789	00 686.0254-0	A
2	Q3	Transistor	00 686.0243-0	B
3	R1	Resistor, Fixed, Composition: 100 ohms ±5%, 1W (Allen-Bradley GB or equal)	00 627.0101-0	A
4	XQ1-6	Socket, Transistor: 2 Contacts (Augat 8080-IG3 or equal)	00 650.0176-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE
POWER SUPPLY
VOLTAGE REGULATOR

MODEL NO.
0.43.0188-0 Sh. 1 of 1 Sh.

2

DATE 2 / 7 / 69

APPENDIX 2

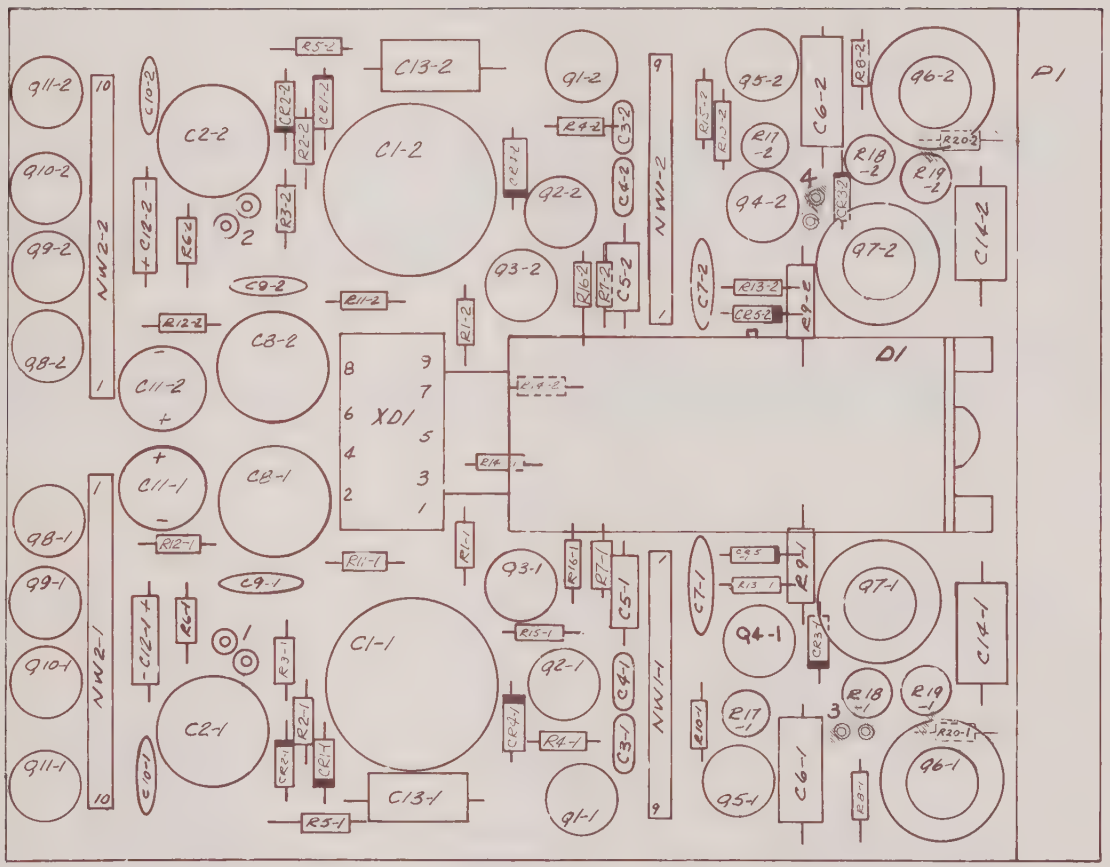
DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

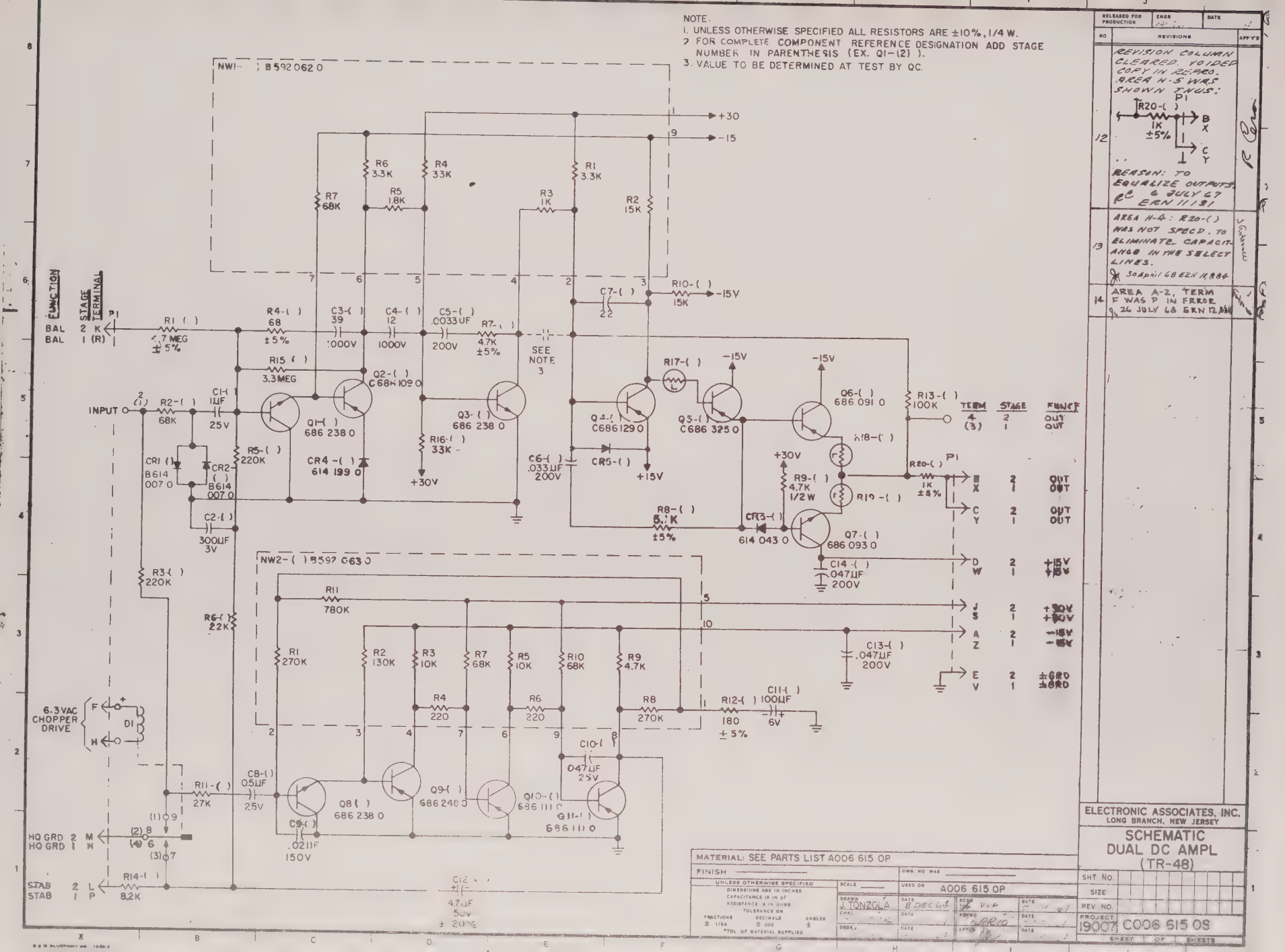
EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

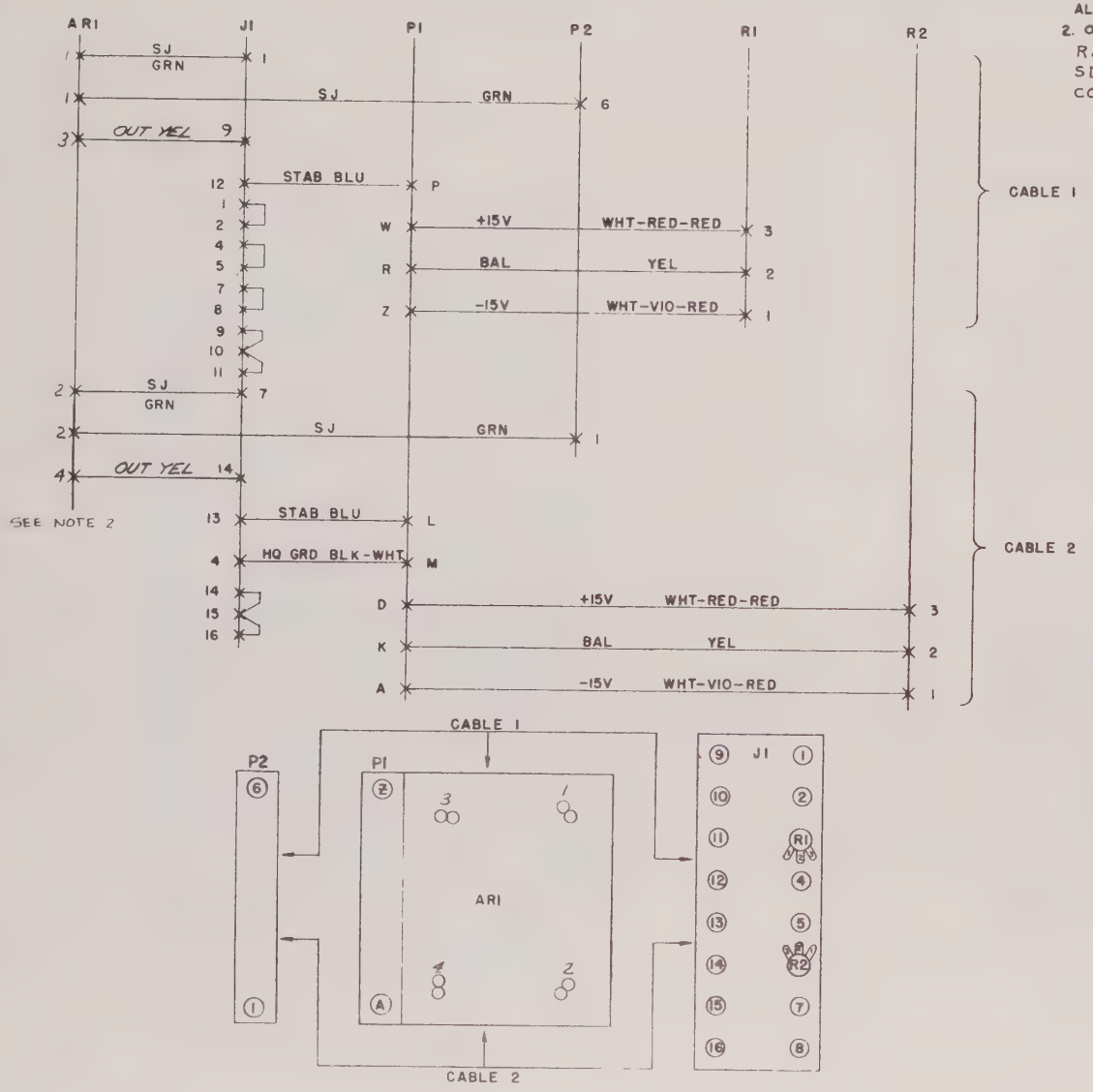
INDEX

Unit or Component	Type of Drawing	Drawing Number
0.6.0626 Dual DC Amplifier	Schematic	C006 615 0S
	Wiring	C006 626 0W
0.10.0309-1 Power Supply	Schematic	C00 010 0309 0S (Sheet 2 Only)
	Wiring	C00 010 0309 0W (Sheet 2 Only)
0.43.0104-1 Reference Regulator Card	Schematic	C043 104 0S (Sheet 2 Only)



6.615-0 Dual DC Amplifier


NOTE.
1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE ±10%, 1/4 W.
2 FOR COMPLETE COMPONENT REFERENCE DESIGNATION ADD STAGE NUMBER IN PARENTHESIS (EX. Q1-(2)).
3. VALUE TO BE DETERMINED AT TEST BY QC.
NW1-( ) B592 062 0
+30
-15
R6 3.3K
R4 33K
R1 3.3K
R7 68K
R5 1.8K
R3 1K
R2 15K
C7-( ) 22
R10-( ) 15K
-15V
FUNCTION
STAGE TERMINAL
BAL 2 K
BAL 1 (R)
P1
R1 ( ) 4.7 MEG ±5%
R4-( ) 68 ±5%
C3-( ) 39 1000V
C4-( ) 12 1000V
C5-( ) .0033 UF 200V
R7-( ) 4.7K ±5%
SEE NOTE 3
R15 ( ) 3.3MEG
Q2-( ) C686 109 0
R17-( )
Q4-( ) C686 129 0
Q5-( ) C686 325 0
Q6-( ) 686 091 0
R13-( ) 100K
TERM STAGE FUNCT
4 (3) 2 1 OUT OUT
INPUT
R2-( ) 68K
C1-( ) 1UF 25V
Q1-( ) 686 238 0
Q3-( ) 686 238 0
R16-( ) 33K
+30V
CR1 ( ) B614 007 0
CR2 ( ) B614 007 0
R5-( ) 220K
CR4-( ) 614 199 0
C6-( ) .033 UF 200V
CR5-( )
+15V
R18-( )
+30V
R9-( ) 4.7K 1/2W
R19-( )
P1
R20-( ) 1K ±5%
B X 2 1 OUT OUT
C Y 2 1 OUT OUT
R8-( ) 5.1K ±5%
CR3-( ) 614 043 0
Q7-( ) 686 093 0
C14-( ) .047 UF 200V
D W 2 1 +15V +15V
C2-( ) 300 UF 3V
R3-( ) 220K
NW2-( ) B592 063 0
R11 780K
R6-( ) 22K
J S 2 1 +30V +30V
A Z 2 1 -15V -15V
R1 270K
R2 130K
R3 10K
R7 68K
R5 10K
R10 68K
R9 4.7K
C13-( ) .047 UF 200V
E V 2 1 ±GRD ±GRD
R4 220
R6 220
R8 270K
R12-( ) 180 ±5%
C11-( ) 100 UF 6V
6.3VAC CHOPPER DRIVE
F
H
D1
C10-( ) .047 UF 25V
R11-( ) 27K
C8-( ) 0.5 UF 25V
Q8-( ) 686 238 0
Q9-( ) 686 248 0
Q10-( ) 686 111 0
Q11-( ) 686 111 0
C9-( ) .02 UF 150V
HO GRD 2 M
HO GRD 1 N
STAB 2 L
STAB 1 P
R14-( ) 8.2K
C12-( ) 4.7 UF 50V ± 20%
RELEASED FOR PRODUCTION
ENGR
DATE
NO
REVISIONS
APP'D
REVISION COLUMN CLEARED. VOIDED COPY IN REPRO. AREA H-5 WAS SHOWN THUS:
R20-( ) 1K ±5%
B X
C Y
REASON: TO EQUALIZE OUTPUTS. QC 6 JULY 67 ERN 11131
AREA H-4: R20-( ) WAS NOT SPECD. TO ELIMINATE CAPACITANCE IN THE SELECT LINES.
30 April 68 ERN 11884
AREA A-2, TERM F WAS P IN ERROR. 24 JULY 68 ERN 12...
ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY
SCHEMATIC
DUAL DC AMPL
(TR-48)
MATERIAL: SEE PARTS LIST A006 615 0P
FINISH
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE ON
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ±
*TOL OF MATERIAL SUPPLIED
SCALE
USED ON A006 615 0P
DRAWN J. TONZOLA 8 DEC 64
CHKD
ENGR
APVD
DRWG NO
SHT NO.
SIZE
REV NO.
PROJECT 19007 C006 615 0S
SHEET OF SHEETS



NOTE:
1. ALL WIRES TO BE #24PHU
ALL JUMPERS TO BE #22 SD-BUS
2. ON ARI (AMPLIFIER CARD) REPLACE R20-1 & R20-2 WITH #22 INSULATED SD-BUS (SEE C 00 006 0626 OA FOR COMPONENT LOCATIONS).

NO.	REVISIONS	APPVD
1	P1 W4... P2 ... P1 ... 3. Z W... 6. A ... 1 WAS A. W1 ... 2 W1 ... 63, ST #322 W1	
2	ON RR REVERSED PINS 1 & 3 ... 10/OCT 63 ST #339	EJM HM
3	IN AREA D-3 ARI DETAIL EYELETS 1 & 2 WERE A & B AND EYELETS 3 & 4 WERE NOT SPEC'D. DELETED J1-9 OUT YEL TO P1-X AND J1-14 OUT YEL TO P1-B. IN AREA A-8, ARI-1 WAS ARI-A, AREA A-6, ARI-2 WAS ARI-B ARI-3 OUT YEL TO J1-9 & ARI-4 OUT YEL TO J1-14 WERE NOT SPEC'D. 17 SEPT 68 ERN TR48-05-0	
4	ADDED NOTE 2 INFO. 17 MAR 69 ERN 380-0800	

RELEASED FOR PRODUCTION — ERCN

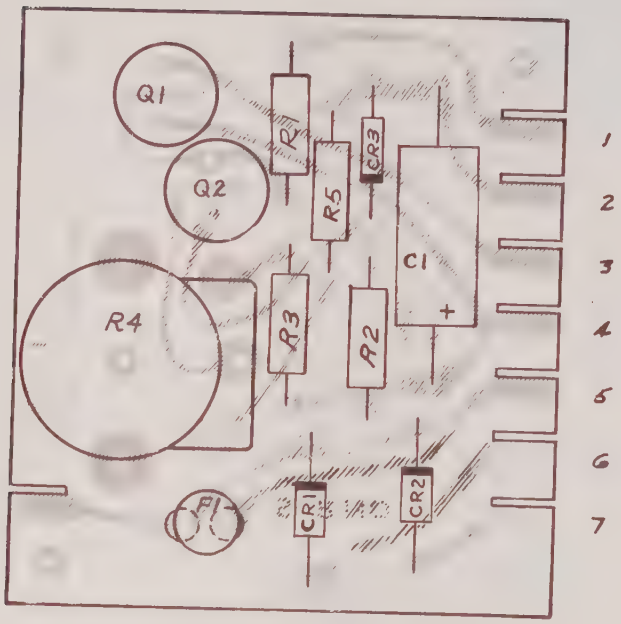
ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY

WIRING
DUAL DC AMPLIFIER
(TR-48)

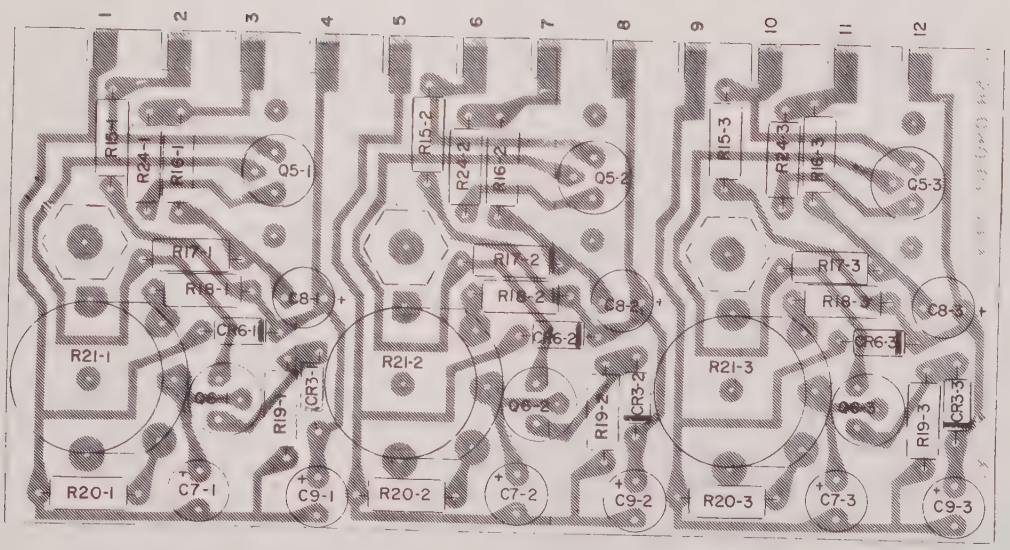
MATERIAL: SEE PARTS LIST A006 626 OP
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
CAPACITANCE IN MFD
RESISTANCE IN OHMS
TOLERANCE ON FRACTIONS ± .04, DECIMALS ± .005, ANGLES ± 1°
* - FURNISHED MATERIAL SUPPLIED

SCALE —
DWG NO WAS —
USED ON A006 626 OP
DRAWN GBARTOLF DATE 31 OCT 62
CHKD DATE
ENGR DATE
APPVD DATE
ECN DATE 26 DEC 63
REVD DATE

SHT NO
SIZE
REV. NO.
PROJECT 19006 C006 626 0W
SHEET OF SHEETS

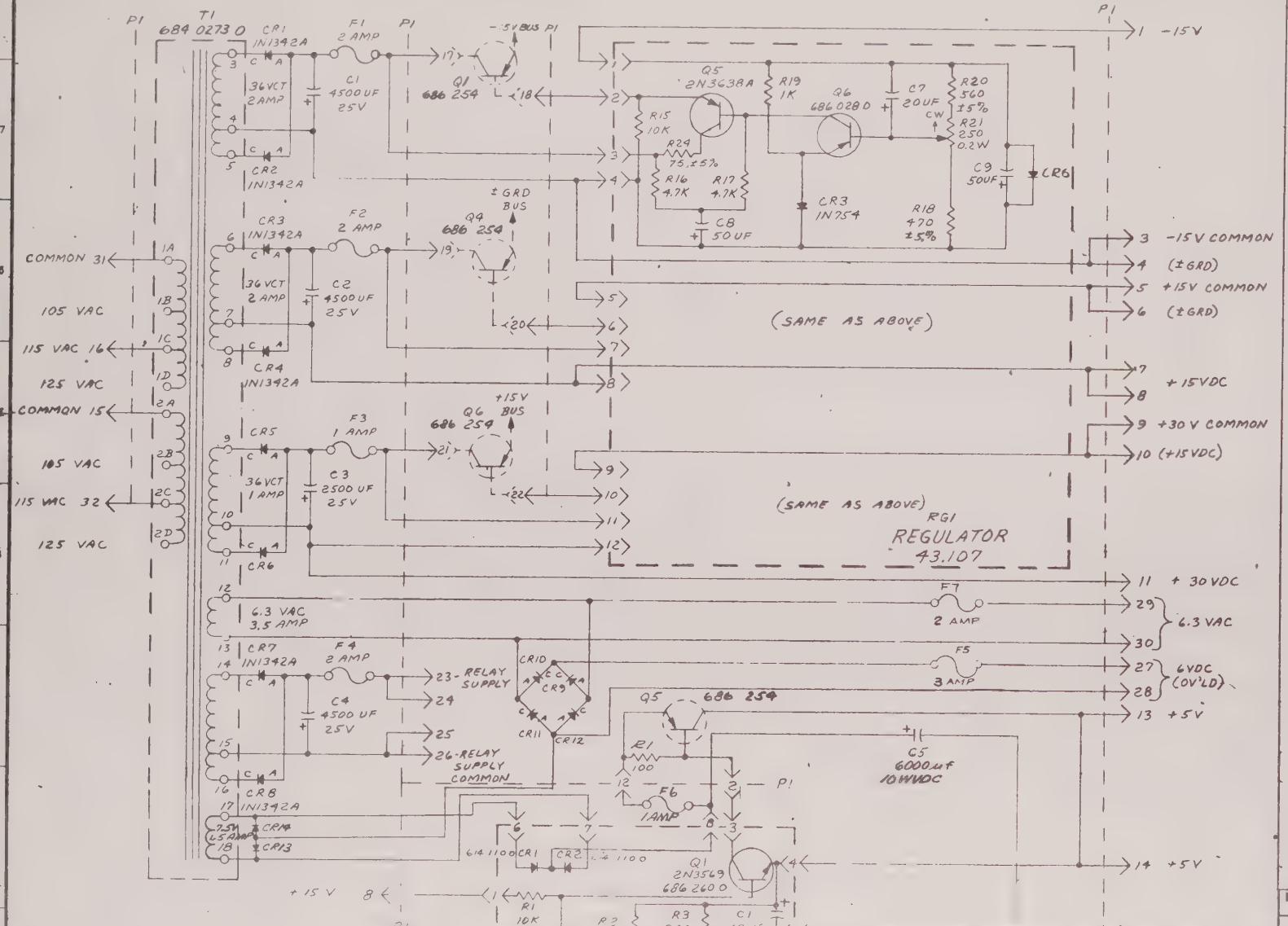


43.165-0 +5V Regulator



43.107-0 Regulator Power Supply

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE ±10%, ½ W. ALL RECTIFIERS ARE 614 110 0.
2. R1, Q3, Q5, Q7, Q8, RELOCATED ON A00 043 0188 0P



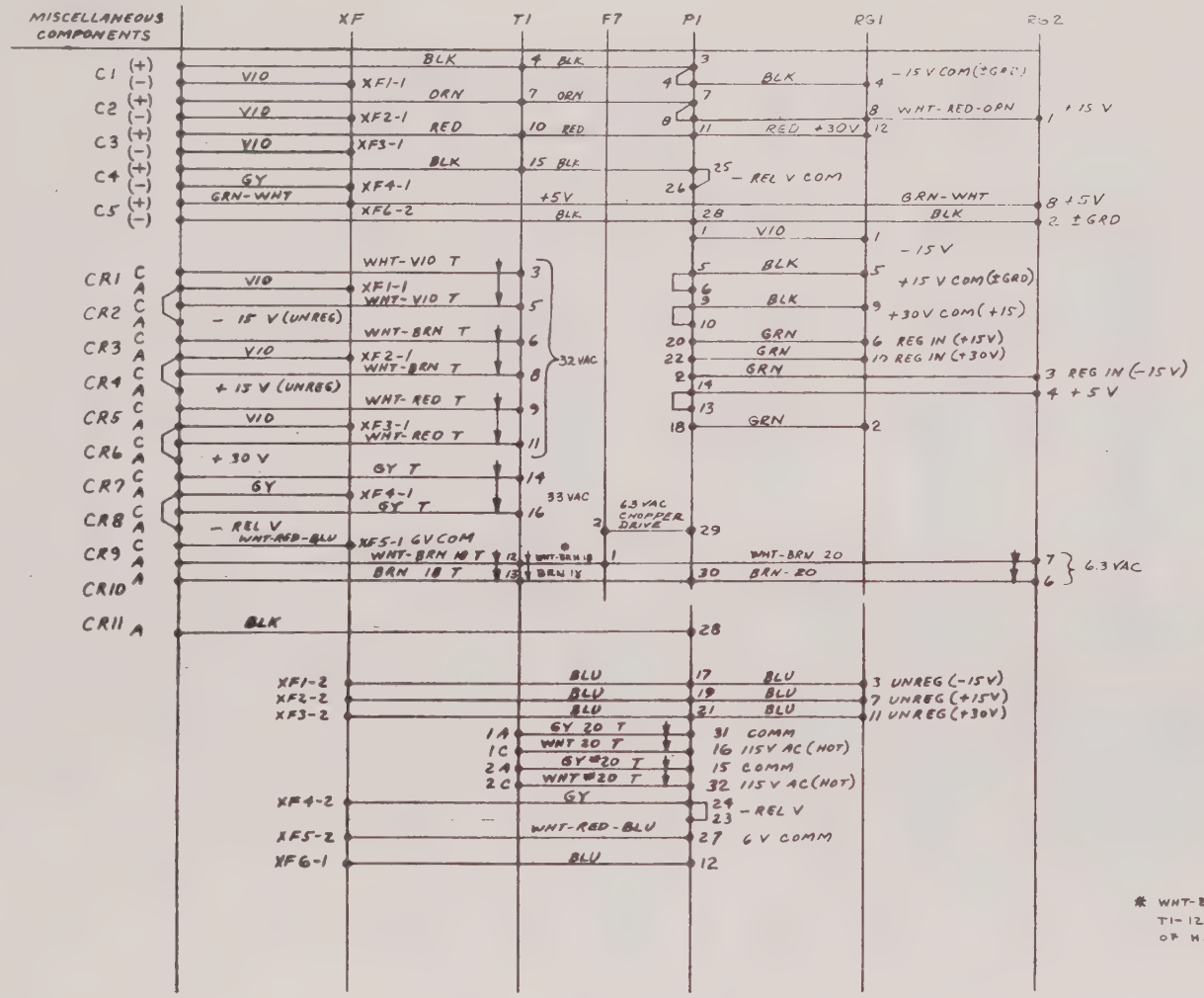
NO	REVISIONS	APP'D
1	FOR CHANGE SEE SHT. 1 REV. B 6MAR69 WERN TR48-018-0	

ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY

MATERIAL:
FINISH:
UNLESS OTHERWISE SPECIFIED

SHT NO
SIZE
REV NO
PROJECT C010 309 05
SHEET 2 OF SHEETS

00 010 0309 15



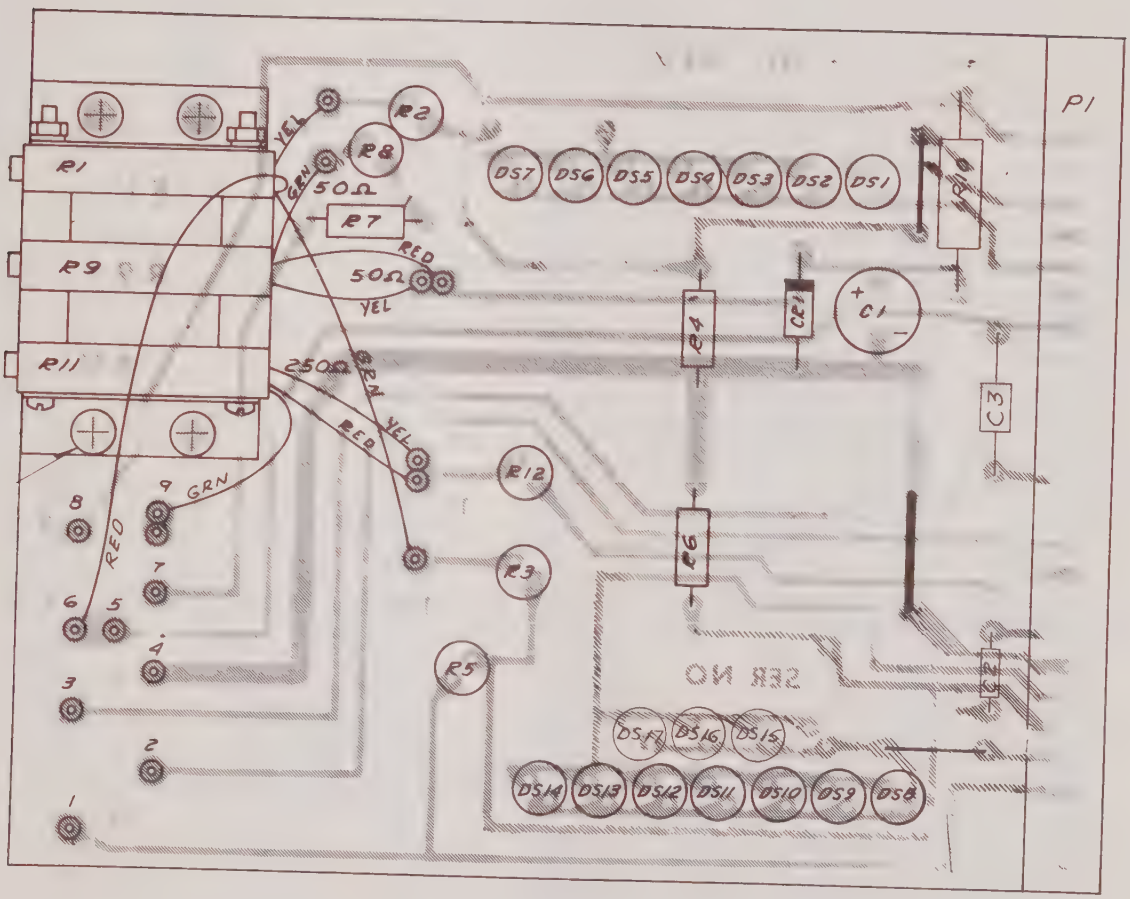
* WHT-BRN 18 WIRE FROM T1-12 TO F7-1 NOT PART OF HARNESS.

NOTES:
1. ALL WIRES ARE PNU 24, 600V
2. ALL BUSS 20 ARE 20.
3. "T" IN WIRE COLOR DENOTES TWISTED PAIR.

00 010 0309 0W

ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY

MATERIAL:		SHT. NO.	
FINISH:		SIZE	
DRAWN	DATE	REV. NO.	
CHKD	DATE	PROJECT 19163	C 010 309 0W
ENGR	DATE	APPVD	DATE

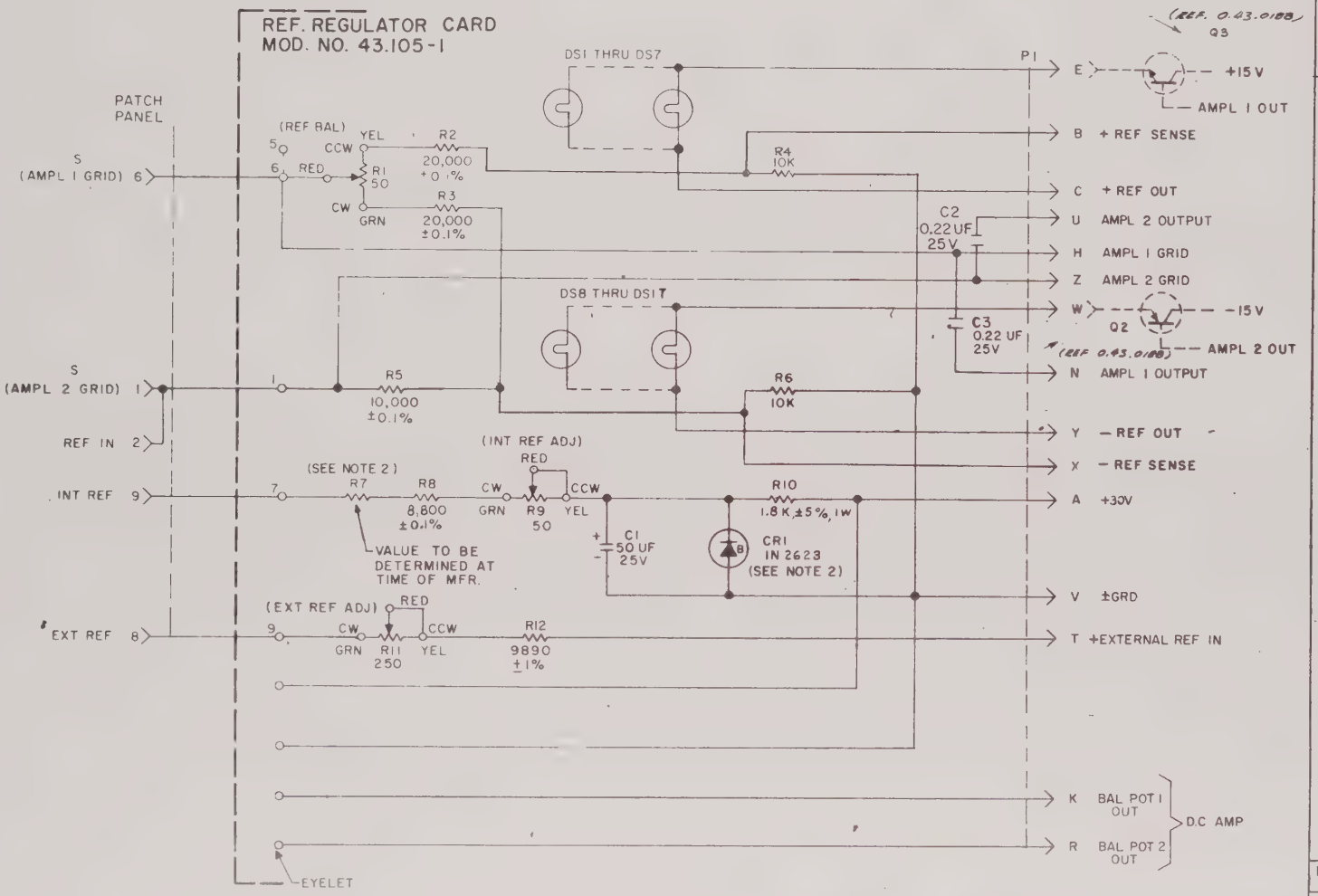


43.105-0 Reference Regulator

NOTES
1 ALL RESISTORS ARE ±10%, 1/2W, UNLESS OTHERWISE SPECIFIED.

2. A012 1738 OP CONSISTS OF CR1 & R7. IF EITHER FAILS, BOTH MUST BE REPLACED.

NO	REVISIONS	APP'D
1	EXTENSIVE CNGES MADE VOID KEY C COPY IN REPRO REASON REDESIGN OF REF 28G. 10 Jan 69 ERN 380-040-1	
2	AREA E-5: DS8 THRU DS17 WAS DS8 THRU DS14. REASON: TO INSURE MAXIMUM LOAD SPECIFICATION OF -10V AT 250 MA. 31 JAN 69 ERN 380-055-0	
3	C3 WAS 220 PF, 500V, CHG'D TO IMPROVE PERFORMANCE. 28 FEB 69 ERN 380-074-0	



ELECTRONIC ASSOCIATES, INC.
LONG BRANCH, NEW JERSEY

SCHEMATIC
REF. REGULATOR

MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

SHT NO
SIZE
REV NO
PROJECT 1718 C 043 104 OS
SHEET 2 OF

CHAPTER

CHAPTER 8

POWER DISTRIBUTION

8.1 INTRODUCTION

This chapter describes both the ac and dc power distribution systems. The dc voltages are generated by the 0.10.0309-1 Power Supply described in Chapter 7 of this manual.

8.2 PRIMARY (AC) POWER DISTRIBUTION

The 380 Computer Console is designed to operate from either a 115 volt or 230 volt ac source. Preparing the computer for operation from either source voltage is a matter of jumpering terminals on terminal board TB1. As shown in Figure 8.1, jumpering terminals 1 and 3, 2 and 4 prepares the computer for 115 volt operation. Jumpering terminals 2 and 3 prepares the computer for 230 volt operation.

The 380 contains two duplex convenience outlets which provide primary power voltage for any peripheral equipment used with the computer. Convenience outlet AC2 is in parallel with the ac input (Figure 8.1) and is hot when the computer is connected to a power source. Convenience outlet AC3 is a switched outlet that provides power only when the computer is turned on. This outlet is protected by Fuse F2.

CAUTION

The voltage present at Receptacles AC2 and AC3 is the same as the primary power voltage. Do not connect 115 volt accessories to this outlet if the computer is powered from a 230 volt ac source.

Depressing the POWER switch connects the line voltage to the TB1 and TB2 terminals. Depressing the POWER switch again removes the power from the unit.

Chopper drive voltage for the chopper stabilized amplifiers in the computer, is provided by output windings on Transformer T1 located in the 0.10.0309-1 Power Supply. This voltage is distributed through the computer bus bar system.

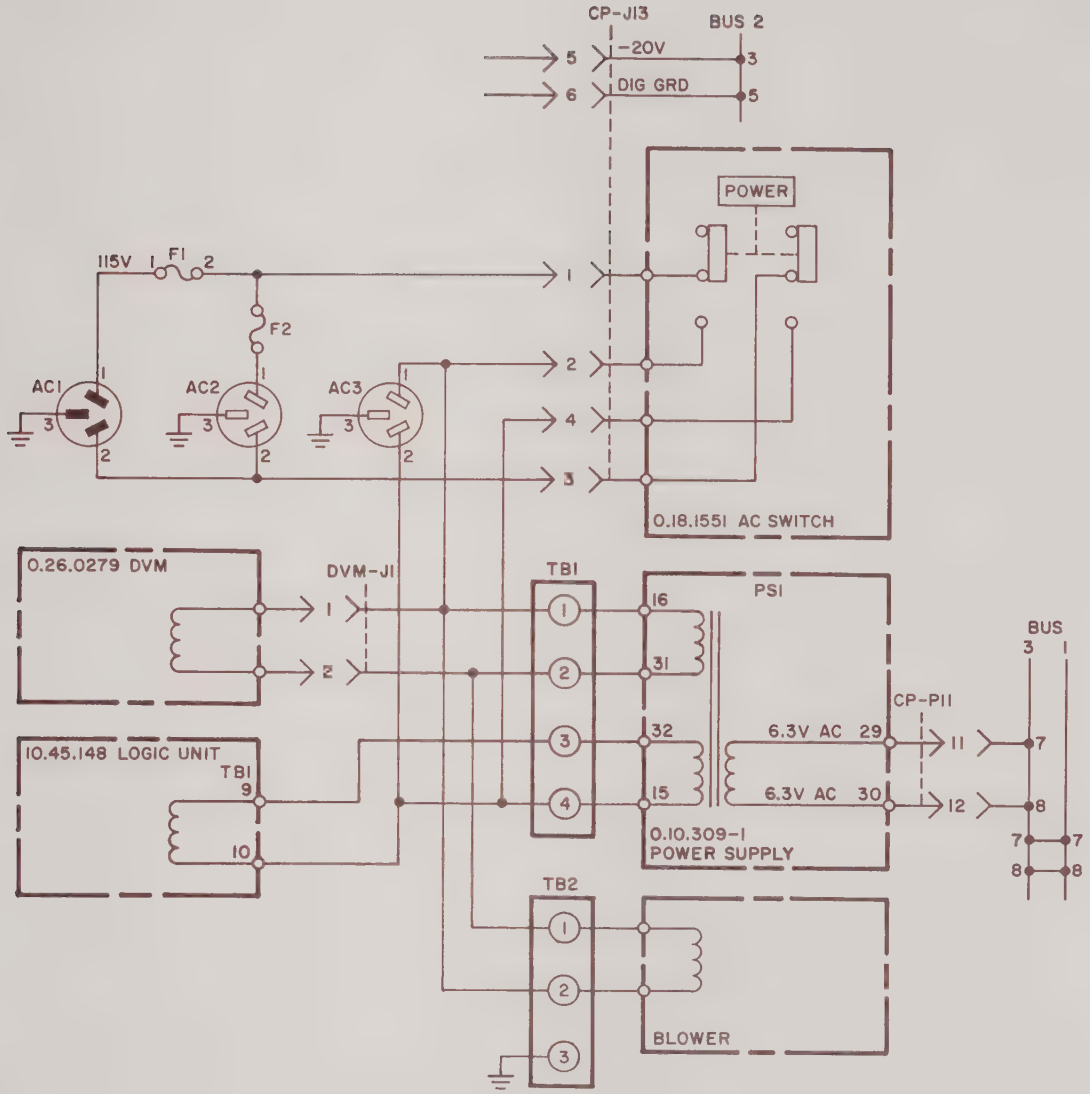
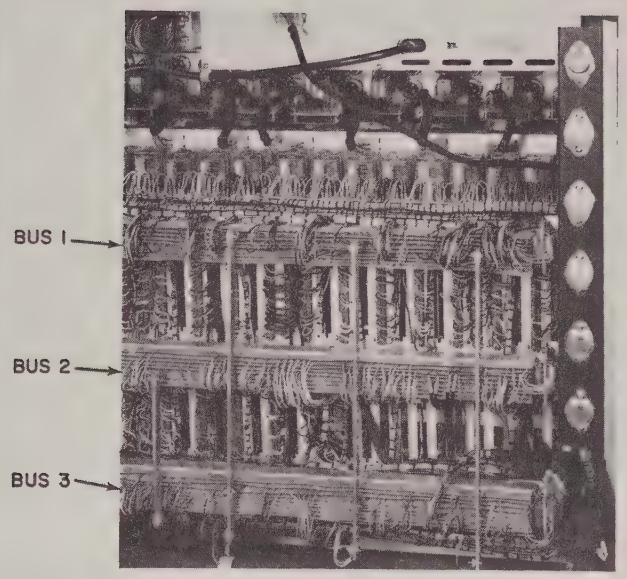


Figure 8.1. Primary Power Distribution

8.3 SECONDARY (DC) POWER DISTRIBUTION

Direct current voltages from the power supply is distributed to all components of the computer by bus bars (Figure 8.2). Sheet 1 of Drawing D00 093 0067 0W in Chapter 1 of this manual illustrates secondary power distribution. Other sheets of this drawing also show small portions of power distribution wiring. Refer to the appropriate sheets for detailed distribution information.



	1
	2
	3
	4
	5
	6
	7
	8

TYPICAL BUS BARS

BUS BAR VOLTAGES AND SIGNALS

	BUS		
	#1	#2	#3
1	HQ GRD	+10V	HQ GRD
2	−15V	−10V	−15V
3	+15V	−20V	+15V
4	+30V	+5V	+30V
5	±GRD	DIG GRD	±GRD
6	SP	OP	SP
7	6.3V AC	IC	6.3V AC
8	6.3V AC	TS	6.3V AC

Figure 8.2. Bus Bar Layout

APPENDIX 1

REPLACEABLE PARTS LISTS

This appendix contains Replaceable Parts Lists for the equipment described in this manual. In each case, a brief description of the part, the EAI part number and, where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column indicates the availability of each part so that a replacement can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier.

Category "B" - The parts in category "B" are proprietary items that are available only from EAI.

CAUTION

If proprietary items are replaced with items obtained from other sources, EAI cannot assume responsibility for a unit not operating within its published specifications.

ORDERING INFORMATION

The following procedures should be used to expedite orders for replacement parts.

1. Specify the EAI part number and description of the part required. The model number and serial number of the next higher assembly should also be included.

NOTE

EAI is currently revising the part numbering system. All parts effected by this revision are identified using the new and the old number (the number in parenthesis). All parts should be ordered using the new number. The old number is provided to cross reference parts that may still be identified physically, or in other publications by that number.

2. When ordering complete assemblies (networks, printed circuit cards, etc.), specify the model and serial numbers of the equipment the assembly is to be used with. If possible, include the purchase order number or the EAI project number of the original equipment purchased.

3. When ordering expansion components, note if mounting hardware is required. If hardware is needed, add to the purchase order the statement "INCLUDING MOUNTING HARDWARE".

NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LISTS INDEX

Title	Page
0.12.1641-0 Bus Bar Network	8-7

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1	C1,2,3,4,7	Capacitor, Fixed, Electrolytic: 100 uf ±20%, 20V (Sprague Type 150D or equal)	00 517.1107-3	A
2	C5,6	Capacitor, Fixed, Electrolytic: 47 uf ±20%, 35V (Sprague Type 150D or equal)	00 517.1476-4	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
A - INDICATES PARTS THAT SHOULD BE PURCHASED LOCALLY.
B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

UNIT TITLE

BUS BAR NETWORK

MODEL NO.

0.12.1641-0 Sh. 1 of 1 Sh.

DATE 12 / 23 / 68

APPENDIX 2

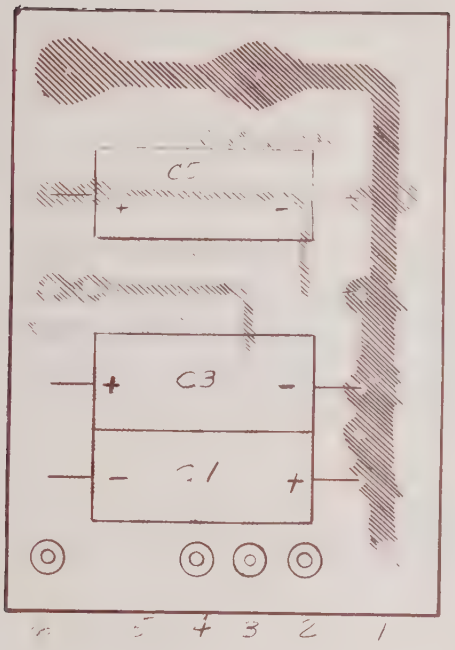
DRAWINGS

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

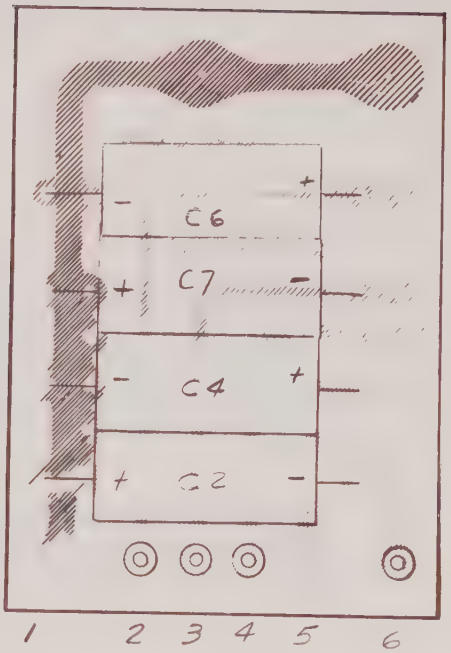
EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

INDEX

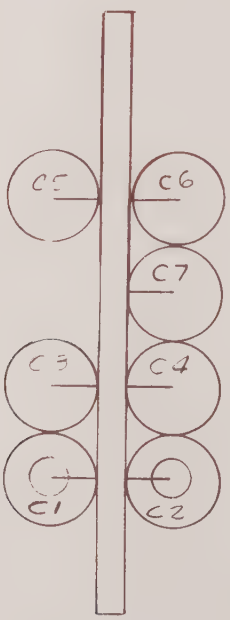
Unit or Component	Type of Drawing	Drawing Number
0.12.1641 Bus Bar Network Card	Schematic	A00 012 1641 0S



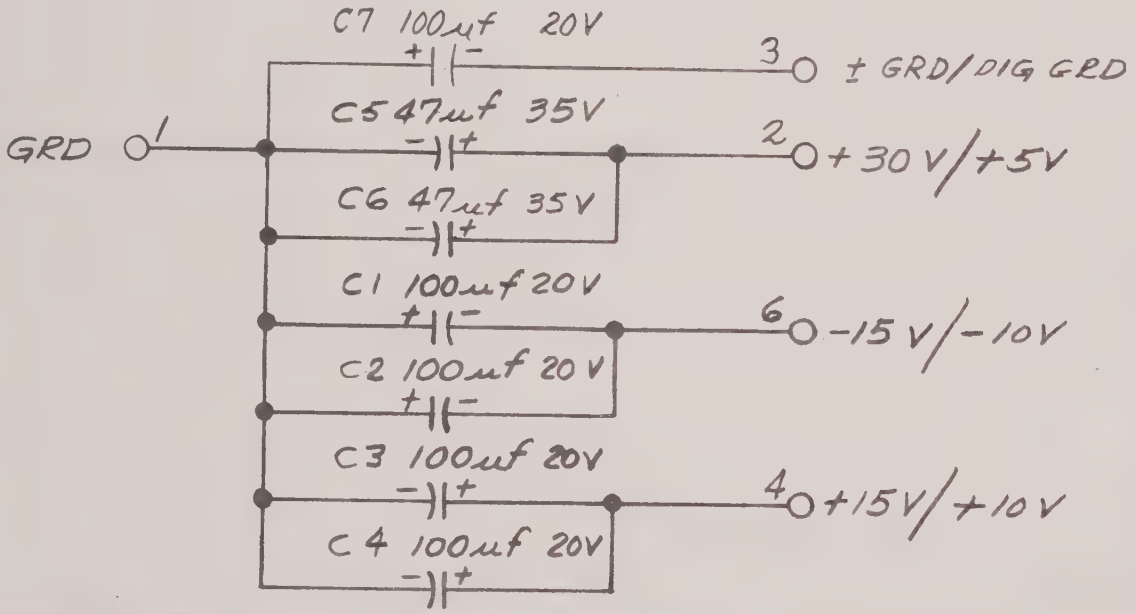
COMPONENT SIDE



COPPER SIDE



12.1641-0 Bus Bar Network



RELEASED FOR PRODUCTION:	ENGR NHS	DATE 4-1[illegible]-67

NO.	REVISIONS	APP'V'D
1	Bernd Lang 4/26/67 SUPERSEDED VAR.-1 NO'S. 6 & 2 ON -15V & +30V RESP. WERE IN REVERSE. RC 27 Feb. 68 ERN 11700	PC
2	+5V, -10V & +10V FUNCTIONS WERE NOT SPEC'D. REASON: TO SPECIFY NON LINEAR BUSS CONNECTIONS &/or FUNCTIONS. 12 MAR 68 RC ERN 11561	PC
3	C7 WAS NOT SPEC'D. REASON: TO REDUCE RING-ING ON OUTPUT OF AMPLI-FIER: RV'D SHT 2: RC 1 APR 68 ERN 11,812	PC

* SUPERSEDED BY 0.012.1641 DO NOT MFG W/O AUTH.

UNIT NUMBER	SCHEMATIC NUMBER	PARTS LIST & NEXT ASSY.	DESCRIPTION	PARTS LIST USED ON:	PROJECT NUMBER
* 0.012.1641-1	A00 012 1641 1S	00 012 1641 1P	AS SHOWN PER SHT 2	——	19330
0.012.1641	A00 012 1641 0S	A00 012 1641 0P	AS SHOWN PER SHT 1	——	19330

TABLE OF UNIT NUMBERS

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

SCHEMATIC BUS BAR NETWORK (TR-4)

MATERIAL: SEE TABLE

FINISH: ——

DWG. NO. WAS:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
*TOL. OF MATERIAL SUPPLIED

SCALE ——

USED ON: SEE TABLE

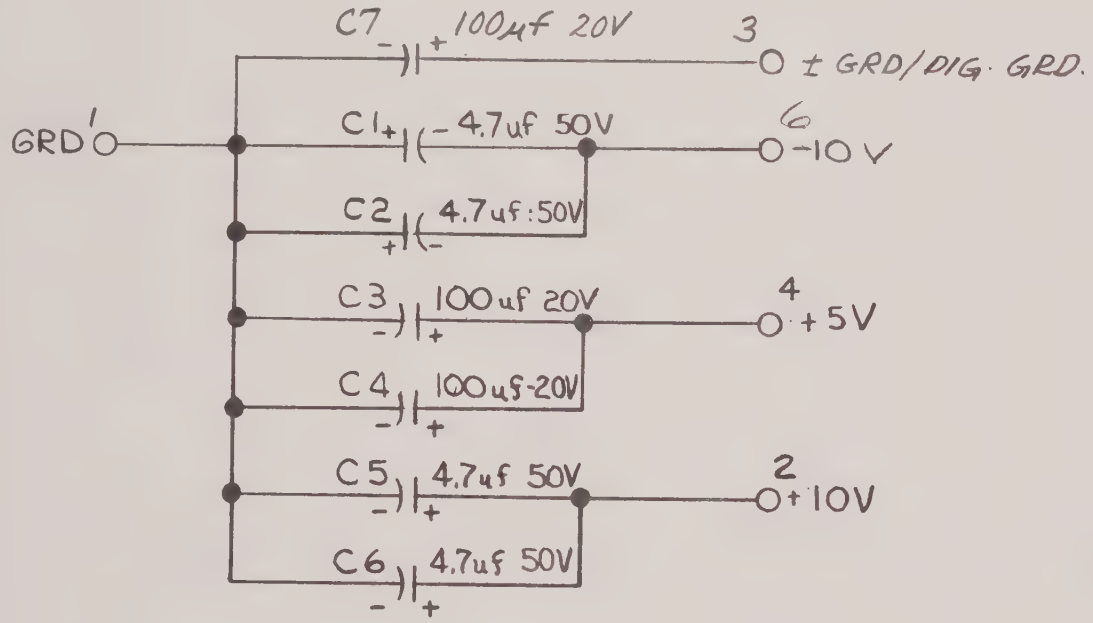
DRAWN L.COLMORGAN	DATE 3 APR 67	RCDR [illegible]	DATE 4-19-67	SHT. NO. 2
CHKD P.GARRAMONE	DATE 4/11/67	REVWD [illegible]	DATE 4-[illegible]-67	SIZE A
DSGR [illegible]	DATE 4/19/67	APPVD [illegible]	DATE 4-19-67	REV. NO. 1

PROJECT 19330 A00 012 1641 05

SHEET 1 OF 2 SHEETS

SHEET OF SHEETS

D & W BLUEPRINT CO. 1368-25



RELEASED FOR PRODUCTION:	ENGR	DATE

NO.	REVISIONS	APP'V'D
1	C7 WAS NOT SPEC'D. 1 APR 68 ECN 11,812	

EAI ELECTRONIC ASSOCIATES, INC. West Long Branch, N.J.

MATERIAL:

FINISH:

DWG. NO. WAS:

USED ON:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CAPACITANCE IS IN pf
RESISTANCE IS IN OHMS
TOLERANCE OF: .X = ± .03 .XX = ± .02 .XXX = ± .015 .XXX = ± .005 ∠ = ± 1°
* TOL. OF MATERIAL SUPPLIED

SCALE			
DRAWN A. KANE	DATE 13APR.67	RCDR	DATE
CHKD	DATE	REVWD	DATE
DSGR	DATE	APPVD	DATE

SHT. NO.	
SIZE	
REV. NO.	
PROJECT 19330	A 00 012 1641 05

SHEET 2 OF SHEETS

SHEET OF SHEETS

D & W BLUEPRINT CO. 1368-25

MANUAL COMMENT SHEET

Date _____

From _____

Company _____

Address _____

_____

Title _____

FOLD

Type of System _____ FOLD

Manual Title _____

EAI Project No. _____ Publication No. _____

Check appropriate block and explain in space provided.

- ☐ Error (Page _____ or Drawing No.)
- ☐ Addition (Page _____, Drawing, Procedure, Etc.)
- ☐ Other

Explanation:

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FOLD FOLD

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No Postage Necessary if Mailed in U.S.A.

STAPLE

STAPLE

FOLD

FOLD

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W. LONG BRANCH, N.J.

BUSINESS REPLY CARD
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POSTAGE WILL BE PAID BY

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185 Monmouth Parkway
West Long Branch, New Jersey 07764

DEPT. 30 - 040

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FOLD

FOLD

STAPLE

STAPLE

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SCIENTIFIC COMPUTATION